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THE

EXECUTIVE DOCUMENTS

OF THE

HOUSE OF REPRESENTATIVES

FOR THE

FIRST SESSION OF THE FIFTY-SECOND CONGRESS.

1891-'92.

IN THIRTY-EIGHT VOLUMES.

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1892.

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Missouri River, Montana, report of survey between Great Falls and Stubbs Ferry	114	34
Murderkill River, Delaware, report of survey	21	29
Nell (United States launch) submitting statement of losses of employés on, by sinking of	93	34
New River and Swansboro, N. C., report on survey of water way between	26	29
Olympia Harbor, Washington, report on survey of	32	30
Pacific Coast, California, report of examination for deep-water harbor on	39	30
Patrol (U. S. S.), submitting claim for losses of clothing by crew of	264	37

Subject	No.	Vol.
Secretary of War:		
Communications from—		
Penobscot River, Maine, report on survey	37	30
Port Day, New York, report of survey of	67	33
Potomac River (up to Washington), report of survey	33	30
Printing and binding, relative to certain, for War Department	171	35
Puget Sound, Washington, report on cost, etc., of canal to connect Lakes Union, Samamish, and Washington with	40	30
Red River of the North, Wisconsin, survey of, above Fergus Falls and Crookston	127	34
Report of survey of Lower Willamette and Columbia rivers	38	30
Rifle competitions, submitting letter relative to rations for contestants in	166	35
Rock Hall Harbor, Maryland, report of survey	56	33
Rock Island Arsenal, estimates of appropriation for	191	35
Rock Island Arsenal and bridge, letter of supplemental estimates for	121	34
Sabine River, Texas, report of examination of	20	29
St. Louis River, Minnesota and Wisconsin, report of survey	58	33
St. Mary Falls Canal, transmitting report of commerce passing through	18	29
San Diego, report of examination for site for coast and harbor defenses	14	29
San Joaquin River, California, report of survey of	108	34
Savannah-Fernandina water way, report of survey	41	30
Soldiers' Home, Washington, D. C., transmitting letter requesting omission of dates in appropriations for	98	34
Springfield (Mass.) Arsenal, letter of supplemental estimates for	121	34
Surgeon-General's Office, relative to binding, etc., for	155	35
Susquehanna River, Maryland, report of survey	52	33
Swinomish Slough, Washington, report of survey	31	30
Tillamook Bay and Bar, Oregon, report of survey	35	30
Type and other guns, report on cost of	13	29
War Department, letter transmitting list of clerks and others employed in	17	29
Printing and binding, letter relative to deficiencies in appropriations for	136	35
West Galveston Bay, Texas, report of survey	22	29
Willamette River, Oregon, report of survey	28	29
Yazoo River, Mississippi, report on survey	125	34
Seul Choix Pointe, Mich., relative to additional expenditure for light station at	190	35
Shoshones (*see* Indians)	70	33
Signal officer, annual report	1	10
Sioux. (*See* Indians.)		
Smithsonian Institution, National Zoölogical Park, estimates of appropriation for	102	34
Snake River, letter suggesting extension of improvement of, to Asotin	77	33
Soldiers' Home, Washington, D. C., letter requesting omission of date in appropriations for	98	34
Pacific branch, estimate of appropriation for improvement of	145	35
Southwest Ledge, Conn., to replace light, etc., by steam fog whistle	90	34
Springfield (Mass.) Arsenal, supplemental estimates of appropriations	121	34
Statesville, N. C., relative to heating apparatus for public building at	188	35
Statistical abstract, draft of a bill to provide for annual printing of the	54	33
Report for 1891	53	33
Subsidiary coin, estimate of appropriation for recoinage of	181	35

Subject.	No.	Vol.
Sugar trust, report of suit filed against, for violation of law against trusts	225	37
Surgeon-General's Office, letter relative to binding, etc., for	155	35
Susquehanna River, Maryland, report on survey of	52	33
Swansboro and New River, North Carolina, report of survey of water way between	26	29
Swinomish Slough, Washington, letter of Secretary of War relative to improvement of	31	30
Territories, miners in, estimate to carry out law for protection of	169	35
Tests of iron and steel (1891)	161	36
Tillamook Bay and bar, Oregon, report of survey	35	30
Tin plate, response to House resolution relative to drawbacks on	138	35
Treasurer of the United States, annual report	2	23
Treasury, estimate for check and draft paper for	175	35
requisition on, relative to unpaid, to June 30, 1892	274	37
Treasury Department, additional room for certain divisions	248	37
Assistant Register, to amend law relative to substitute in case of vacancy, etc., in office of	256	37
Bureau of Statistics, relative to an additional clerk for	228	37
claims allowed by accounting officers (exhausted balances, etc.)	199	35
claims allowed by accounting officers of, and paid from indefinite appropriations	184	35
compensation, letter of the Secretary relative to eliminating certain lines in sundry civil bill relating to	271	37
First Comptroller's Office, relative to extra work by employés of	268	37
official business, relative to requests for of absence on	275	37
report of contingent expenses of	44	30
requests for leaves on official business	275	37
Treasury notes, to extend act of 1872 to certain	262	37
Type and other guns, report on cost of	13	29
Umatillas. (*See* Indians.)		
United States Coast and Geodetic Survey—		
Report of Superintendent of, part 1	43	31
Report of Superintendent of, part 2	43	32
United States prisons, relative to appropriations to erect	130	34
Utah penitentiary, estimates of appropriation for	139	35
estimates for establishing electric plant	115	34
letters of United States marshal relative to, part 2	139	37
Vanderbilt, F. W., claim of	206	35
Vicksburg, Miss., relative to heating apparatus for public building at	188	35
Wandrian (English schooner), relative to appropriation to adjust damages to	234	37
War Department:		
Annual report of Secretary	1	2
Clerks and others employed in, list of	17	29
Inspector-General's Office, relative to additional force for	240	37
Military establishment, report of contingent expenditures for	49	33
Printing and binding for, estimates of deficiency in appropriations for	136	35
Printing and binding for, letter of Secretary of War relative to	171	35
Relative to additional room space for division of military information	221	37
Supplemental estimates for the	81	34

DEPARTMENT OF THE INTERIOR,
OFFICE OF INDIAN AFFAIRS,
Washington, December 4, 1891.

SIR: I have the honor to submit the following statements called for by section 8 of an act approved March 3, 1875 (18 Stat., 450):

First. Statement of disbursements made from the several appropriations for the Indian Department for the fiscal year ending June 30, 1891, showing the objects for which made, and the balance unexpended of each appropriation.

Second. Statement of the salaries and incidental expenses paid at each agency in the Indian service during the year ending June 30, 1891, showing appropriations from which paid, and the number of Indians at each agency.

Very respectfully, your obedient servant,

T. J. MORGAN,
Commissioner.

The SECRETARY OF THE INTERIOR.

Statement of disbursements made from the appropriations for the

Heads of appropriations.	Amount appropriated.	OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.			
		Pay of Indian agents.	Pay of special agents.	Pay of interpreters.	Buildings at agencies and repairs.
Aggregate	*Dollars.* 7,140,288.27	*Dollars.* 81,869.09	*Dollars.* 10,000.00	*Dollars.* 20,895.36	*Dollars.* 22,935.97
Current and contingent expenses.					
Pay of Indian agents, 1891	88,938.91	81,869.09			
Pay of interpretors, 1891	25,000.00			20,895.36	
Pay of Indian inspectors, 1891	15,000.00				
Traveling expenses of Indian inspectors, 1891	7,000.00				
Pay of Indian school superintendent, 1891	4,000.00				
Traveling expenses of Indian school superintendent, 1891	2,000.00				
Buildings at agencies and repairs, 1891	25,000.00				22,935.97
Contingencies, Indian Department, 1891	44,000.00		10,000.00		
Expenses of Indian commissioners, 1891	5,000.00				
Fulfilling treaties with and support of Indian tribes (treaty obligations).					
Fulfilling treaties with—					
Apaches, Kiowas, and Comanches	30,000.00				
Cheyennes and Arapahoes	20,000.00				
Chickasaws	3,000.00				
Chippewas of the Mississippi	1,000.00				
Chippewas, Pillagers, and Lake Winnebagoshish bands	22,666.66				
Choctaws	29,432.89				
Columbias and Colvilles	1,100.00				
Creeks	69,968.40				
Crows	30,000.00				
Fort Hall Indians	6,000.00				
Indians at Blackfeet Agency	150,000.00				
Indians at Fort Belknap Agency	115,000.00				
Indians at Fort Peck Agency	165,000.00				
Iowas	2,875.00				
Kansas	1,524.02				
Kickapoos	3,682.44				
Miamis of Kansas	29,033.89				
Osages	3,456.00				
Otoes and Missourias	5,000.00				
Pawnees	30,000.00				
Pottawatomies	20,647.65				
Sacs and Foxes of the Mississippi	51,000.00				
Sacs and Foxes of the Missouri	7,870.00				
Seminoles	28,500.00				
Senecas	3,690.00				
Senecas of New York	11,902.50				
Shawnees	5,000.00				
Eastern Shawnees	1,030.00				
Sioux, Yankton tribe	15,000.00				
Six Nations of New York	4,500.00				
Winnebagoes	44,162.47				
Gratuity to certain Ute Indians	4,000.00				
Support of—					
Apaches, Kiowas, and Comanches, clothing, 1891	11,000.00				
Apaches, Kiowas, and Comanches, employés, 1891	7,200.00				
Cheyennes and Arapahoes, clothing, 1891	12,000.00				
Cheyennes and Arapahoes, employés, 1891	6,500.00				
Chippewas of the Mississippi, 1891	4,000.00				
Columbias and Colvilles, 1891	6,000.00				
Confederated bands of Utes, employés, 1891	13,520.00				
Confederated bands of Utes, beneficial objects, 1891	30,220.00				
Confederated bands of Utes, subsistence, 1891	30,000.00				
Crows, clothing, 1891	15,000.00				
Crows, employés, 1891	6,000.00				

Indian Department for the fiscal year ending June 30, 1891.

OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.

Vaccination of Indians.	Medicines and medical supplies.	Subsistence supplies.	Annuity goods, agricultural and miscellaneous supplies.	Expenses of transportation and storage.	Purchase and inspection of annuity goods and supplies.	Advertising expenses and telegraphing.	Payments of annuities in money.	Pay of regular employés at agencies.
Dollars.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
156.00	10,446.70	1,228,102.74	785,874.47	297,853.36	35,847.79	9,203.17	742,961.64	313,709.32
	181.84	548.09	8,695.52			52.65		8,819.78
							3,000.00	
			1,268.94				10,666.66	
							29,432.89	
							1,100.00	
							69,968.40	
	281.41	23,521.00	4,650.76					
								3,113.20
	216.67	50,373.41	5,714.80					6,450.00
								7,520.00
	20.81	137.57	334.04				341.22	1,206.32
	2.48	261.48	1,353.57					1,784.67
							28,632.30	
			399.75					3,744.54
		141.82						
							17,866.29	
							42,899.45	
							7,870.00	
							28,500.00	
			60.00				3,160.00	470.00
							11,902.50	
							5,000.00	
							500.00	
		7,425.91						
	112.52		3,284.53				947.91	
	267.86		8,243.71				28,984.78	6,400.00
			11,000.00					
								5,488.88
			12,000.00					
								3,100.00
								4,125.79
								11,546.97
	460.33	1,534.61	27,324.50					
		30,000.00						
			15,000.00					
			295.44					4,049.91

Statement of disbursements made from the appropriation for the Indian

Heads of appropriations.	OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.				
	Pay of temporary employés at agencies.	Support of schools.	To promote civilization among Indians generally, including Indian labor.	Traveling expenses of Indian agents.	Traveling expenses of special agents.
	Dollars.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
Aggregate	4, 527. 74	1, 882, 471. 37	99, 971. 93	9, 094. 75	9, 146. 54
Current and contingent expenses.					
Pay of Indian agents, 1891					
Pay of interpretors, 1891					
Pay of Indian inspectors, 1891					
Traveling expenses of Indian inspectors, 1891					
Pay of Indian school superintendent, 1891		4, 000. 00			
Traveling expenses of Indian school superintendent, 1891		1, 683. 74			
Buildings at agencies and repairs, 1891					
Contingencies, Indian Department, 1891	1, 838. 70		359. 50	8, 583. 65	9, 146. 54
Expenses of Indian commissioners, 1891					
Fulfilling treaties with and support of Indian tribes (treaty obligations).					
Fulfilling treaties with—					
Apaches, Kiowas, and Comanches					
Cheyennes and Arapahoes					
Chickasaws					
Chippewas of the Mississippi					
Chippewas, Pillagers, and Lake Winnebagoshish bands					
Choctaws					
Columbias and Colvilles					
Creeks					
Crows		72. 00			
Fort Hall Indians					
Indians at Blackfeet Agency					
Indians at Fort Belknap Agency	99. 00	33, 446. 93	1, 623. 00		
Indians at Fort Peck Agency			1, 895, 20		
Iowas		13. 92			
Kansas		1, 419. 20			
Kickapoos	43. 50	13. 92	12. 00		
Miamis of Kansas					
Osages		2, 814. 55			
Otoes and Missourias					
Pawnees					
Pottawatomies					
Sacs and Foxes of the Mississippi		5. 000. 00			
Sacs and Foxes of the Missouri					
Seminoles					
Senecas					
Senecas of New York					
Shawnees					
Eastern Shawnees					
Sioux, Yankton tribe					
Six Nations of New York					
Winnebagoes	206. 12				
Gratuity to certain Ute Indians					
Support of—					
Apaches, Kiowas, and Comanches, clothing, 1891					
Apaches, Kiowas, and Comanches, employés, 1891		1, 129. 95	581. 17		
Cheyennes and Arapahoes, clothing, 1891					
Cheyennes and Arapahoes, employés, 1891					
Chippewas of the Mississippi, 1891		3, 989. 73			
Columbias and Colvilles, 1891					
Confederated bands of Utes, employés, 1891		404. 99	452. 47		
Confederated bands of Utes, beneficial objects, 1891					
Confederated bands of Utes, subsistence, 1891					
Crows, clothing, 1891					
Crows, employés, 1891			1, 650. 00		

Statement of disbursements made from the appropriations for the

Heads of appropriations.	Amount appropriated.	OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.			
		Pay of Indian agents.	Pay of special agents.	Pay of interpreters.	Buildings at agencies and repairs.
Fulfilling treaties with and support of Indian tribes (treaty obligations)—Continued.					
For support of—	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
Crows, subsistence, 1891	40,000.00				
Molels, 1891	3,000.00				
Nez Percés, 1891	6,000.00				
Northern Cheyennes and Arapahoes, clothing, 1891	12,000.00				
Northern Cheyennes and Arapahoes, employés, 1891	9,000.00				
Northern Cheyennes and Arapahoes, subsistence and civilization, 1891	35,000.00				
Pawnees, schools, 1891	10,000.00				
Pawnees, employés, 1891	6,600.00				
Pawnees, iron and steel, 1891	500.00				
Quapaws, education, 1891	1,000.00				
Quapaws, employés, 1891	500.00				
Sacs and Foxes of the Missouri, 1891	200.00				
Bannocks, clothing, 1891	5,000.00				
Bannocks, employés, 1891	5,000.00				
Shoshones, clothing, 1891	10,000.00				
Shoshones, employés, 1891	6,000.00				
Sioux, Yankton tribe, 1891	35,000.00				
Sioux of different tribes, clothing, 1891	125,000.00				
Sioux of different tribes, beneficial objects, 1891	150,000.00				
Sioux of different tribes, employés, 1891	32,500.00				
Sioux of different tribes, schools, Santee Sioux and Crow Creek agencies, 1891	6,000.00				
Sioux of different tribes, subsistence and civilization, 1891	950,000.00				
Miscellaneous support—gratuities.					
Arapahoes, Cheyennes, Apaches, Kiowas, Comanches, and Wichitas, 1891	240,000.00				
Arickarees, Gros Ventres, and Mandans, 1891	30,000.00				
Chippewas of Lake Superior, 1891	5,000.00				
Chippewas of Red Lake and Pembina, 1891	10,000.00				
Chippewas of Turtle Mountain band, 1891	13,000.00				
Chippewas on White Earth Reservation, 1891	10,000.00				
Confederated tribes and bands in Middle Oregon, 1891	6,000.00				
D'Wamish and other allied tribes in Washington, 1891	7,000.00				
Flatheads and other confederated tribes, 1891	10,000.00				
Flatheads, Carlos band, 1891	12,000.00				
Hualpais in Arizona, 1891	7,500.00				
Indians in Arizona and New Mexico, 1891	170,000.00				
Indians of Fort Hall Reservation, 1891	13,000.00				
Indians of Klamath Agency, 1891	5,000.00				
Indians of Lemhi Agency, 1891	14,000.00				
Kansas Indians, 1891	2,500.00				
Makahs, 1891	4,000.00				
Menomonees, 1891	4,000.00				
Modocs in the Indian Territory, 1891	4,000.00				
Navajoes, 1891	7,500.00				
Nez Percés in Idaho, 1891	6,500.00				
Nez Percés of Joseph's band, 1891	12,000.00				
Northern Cheyennes and Arapahoes, Tongue River, 1891	25,000.00				
Kickapoos, 1891	5,000.00				
Poncas, 1891	18,000.00				
Quinaielts and Quillehutes, 1891	4,000.00				
Seminoles and Creeks in Florida, 1891	6,000.00				
Shoshones in Nevada, 1891	10,000.00				
Shoshones in Wyoming, 1891	15,000.00				
Sioux of Devils Lake, 1891	6,000.00				

Statement of disbursements made from the appropriations for the Indian

Heads of appropriations.	OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.				
	Pay of temporary employés at agencies.	Support of schools.	To promote civilization among Indians generally, including Indian labor.	Traveling expenses of Indian agents.	Traveling expenses of special agents.
***Fulfilling treaties with and support of Indians tribes (treaty obligations)*—Continued.**	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
Support of—					
Crows, subsistence, 1891					
Molels, 1891		2,694.52			
Nez Percés, 1891	195.00		851.00		
Northern Cheyennes and Arapahoes, clothing, 1891					
Northern Cheyennes and Arapahoes, employés, 1891	40.00	600.00	1,388.24		
Northern Cheyennes and Arapahoes, subsistence and civilization, 1891					
Pawnees, schools, 1891		9,653.77			
Pawnees, employés, 1891		630.00	1,342.38		
Pawnees, iron and steel, 1891					
Quapaws, education, 1891		1,000.00			
Quapaws, employés, 1891			175.00		
Sacs and Foxes of the Missouri, 1891		200.00			
Bannocks, clothing, 1891					
Bannocks, employés, 1891			1,027.00		
Shoshones, clothing, 1891					
Shoshones, employés, 1891		400.00	660.00		
Sioux, Yankton tribe, 1891			2,873.03		
Sioux of different tribes, clothing, 1891					
Sioux of different tribes, beneficial objects, 1891					
Sioux of different tribes, employés, 1891		1,509.00	4,293.64		
Sioux of different tribes, schools, Santee Sioux and Crow Creek Agencies, 1891		5,995.72			
Sioux of different tribes, subsistence and civilization, 1891	478.80	55,135.18	39,428.62		
Miscellaneous support—gratuities.					
Arapahoes, Cheyennes, Apaches, Kiowas, Comanches, and Wichitas, 1891	19.37	17,273.66	4,638.88		
Arickarees, Gros Ventres, and Mandans, 1891			1,724.35		
Chippewas of Lake Superior, 1891	200.00				
Chippewas of Red Lake and Pembina, 1891			585.00		
Chippewas of Turtle Mountain band, 1891					
Chippewas on White Earth Reservation, 1891			1,775.75		
Confederated tribes and bands in Middle Oregon, 1891			550.00		
D'Wamish and other allied tribes in Washington, 1891			1,340.00		
Flatheads and other confederated tribes, 1891		224.00	1,500.00		
Flatheads, Carlos band, 1891		180.00			
Hualpais in Arizona, 1891					
Indians in Arizona and New Mexico, 1891	180.00		2,846.23		
Indians of Fort Hall Reservation, 1891			27.52		
Indians of Klamath Agency, 1891			480.00		
Indians of Lemhi Agency, 1891	410.00				
Kansas Indians, 1891			75.25		
Makahs, 1891			1,125.17		
Menomonees, 1891			333.69		
Modocs in the Indian Territory, 1891	87.20		197.45		
Navajoes, 1891			210.00		
Nez Percés in Idaho, 1891			117.50		
Nez Percés of Joseph's band, 1891	22.50		90.00		
Northern Cheyennes and Arapahoes, Tongue River, 1891					
Kickapoos, 1891					
Poncas, 1891	15.00		2,259.80		
Quinaielts and Quillehutes, 1891			236.75		
Seminoles and Creeks in Florida, 1891					
Shoshones in Nevada, 1891			778.53		
Shoshones in Wyoming, 1891					
Sioux of Devils Lake, 1891			472.00		

Department for the fiscal year ending June 30, 1891—Continued.

OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.								Total amount expended from each appropriation.	Balance unexpended.
Incidental expenses of agencies.	Pay of Indian police, scouts, and equipments.	Survey of and allotments on Indian reservations.	Pay and expenses of Indian inspectors.	Expenses of Indian commissioners.	Stock cattle.	Miscellaneous.	In hands of agents.		
Dollars.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
								40,000.00	
								2,694.52	305.48
								4,557.26	1,442.74
								8,990.91	3,009.09
								8,691.96	308.04
								34,486.27	513.73
								9,653.77	346.23
								6,225.02	374.98
								302.22	197.78
								1,000.00	
								415.76	84.24
								200.00	
								3,874.00	1,126.00
								5,000.00	
								7,363.67	2,636.38
								5,284.00	716.00
						82.75		34,338.19	661.81
								125,000.00	
					3,822.00			149,869.08	130.92
								31,510.90	989.10
								5,995.72	4.28
						2,484.25		949,045.11	954.89
							15,015.99	224,397.23	586.78
								28,657.63	1,342.37
								4,931.43	68.57
								9,750.00	250.00
							2,018.75	9,994.33	986.92
								9,938.98	61.02
								6,000.00	
								6,047.54	952.46
								9,923.16	76.84
								9,018.42	2,981.58
							4,334.71	2,959.70	205.59
								160,924.58	9,075.42
								12,808.72	191.28
20.00							235.50	4,057.37	707.13
175.00								11,998.72	2,001.28
								1,832.46	667.54
								3,307.63	692.37
								3,708.28	291.72
								3,638.55	361.45
								7,445.19	54.81
								6,158.10	341.90
								7,767.60	4,232.40
								24,816.34	183.66
								1,764.58	3,235.42
								17,647.71	352.29
								2,240.77	1,759.23
								1,028.00	4,972.00
								10,000.00	
								13,834.24	1,165.76
							3,198.17	2,801.83	

Statement of disbursements made from the appropriations for the Indian

Heads of appropriations.	Amount appropriated.	OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.			
		Pay of Indian agents.	Pay of special agents.	Pay of interpreters.	Buildings at agencies, and repairs.
Miscellaneous Support—Gratuities—Continued.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
Sioux of Lake Traverse, 1891	6,000.00				
S'Klallams, 1891	4,000.00				
Tonkawas	5,000.00				
Walla Walla, Cayuse, and Umatilla tribes, 1891	6,500.00				
Yakimas and other Indians, 1891	10,000.00				
General Incidental Expenses, Indian Service.					
Arizona, employés, 1891	8,000.00				
Arizona, including support and civilization, 1891	12,000.00				
California, employés, 1891	9,000.00				
California, including support and civilization, 1891	18,000.00				
Colorado, 1891	1,500.00				
North Dakota, 1891	1,500.00				
South Dakota, 1891	3,500.00				
Idaho, 1891	1,000.00				
Montana, 1891	4,000.00				
Nevada, employés, 1891	6,000.00				
Nevada, including support and civilization, 1891	16,500.00				
New Mexico, including employés and support and civilization, 1891	5,000.00				
Oregon, employés, 1891	6,000.00				
Oregon, including support and civilization, 1891	10,000.00				
Utah, including employés and support and civilization, 1891	8,000.00				
Washington, including employés and support and civilization, 1891	16,000.00				
Wyoming, 1891	1,000.00				
Indian Schools.					
Indian schools, support, 1891	776,870.00				
Indian schools, stock cattle, 1891	10,000.00				
Indian schools in States, support, 1891	75,000.00				
Indian schools, transportation, 1891	40,000.00				
Indian school buildings	125,000.00				
Indian school, Albuquerque, N. Mex., support, 1891	46,500.00				
Indian school, Banning, Cal., support, 1891	12,500.00				
Indian school, Blackfeet Agency, support, 1891	12,500.00				
Indian school, Carlisle, Pa., support, 1891	111,000.00				
Indian school, Carson City, Nev., support, 1891	25,000.00				
Indian school, Cherokee, N. C., support, 1891	13,360.00				
Indian school, Chilocco, Ind. T., support, 1891	50,000.00				
Indian school, Clontarf, Minn., support, 1891	15,000.00				
Indian school, Genoa, Nebr., support, 1891	50,000.00				
Indian school, Grand Junction, Colo., support, 1891	35,000.00				
Indian school, Hampton, Va., support, 1891	20,040.00				
Indian school, Lawrence, Kans., support, 1891	122,500.00				
Indian school, Lincoln Institution, Philadelphia, Pa., support, 1891	33,400.00				
Indian school, Pierre, S. Dak., support, 1891	35,000.00				
Indian school, Rensselaer, Ind., support, 1891	8,330.00				
Indian school, St. Ignatius Mission, Mont., support, 1891	45,000.00				
Indian school, Salem, Oregon, support, 1891	70,750.00				
Indian school, Santa Fé, N. Mex., support, 1891	25,000.00				
Indian school, Wabash, Ind., support, 1891	10,020.00				
Indian schools in Minnesota for Chippewas, support, 1891	15,000.00				
Indian school buildings, Carlisle, Pa	10,000.00				
Indian school buildings, Flandreau, S. Dak	25,000.00				
Indian school buildings, Shoshone Reservation, Wyo	25,000.00				
Indian school buildings for Sioux Nations	15,000.00				

Department for the fiscal year ending June 30, 1891—Continued.

OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.

Vaccination of Indians.	Medicines and medical supplies.	Subsistence supplies.	Annuity goods, agricultural and miscellaneous supplies.	Expenses of transportation and storage.	Purchase and inspection of annuity goods and supplies.	Advertising expenses and telegraphing.	Payments of annuities in money.	Pay of regular employés at agencies.
Dollars.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
	28.02	1,700.00	538.10					1,565.38
								1,300.00
	7.67	1,146.63	1,339.62					720.00
	57.39		2,211.20					3,022.20
		251.16	4,448.20					2,357.07
								6,314.11
	230.87	3,496.72	5,455.92					
								7,767.40
	652.79	5,147.54	10,375.68					
			300.00					
	4.50		1,009.80					
			744.06					
			186.23					
	5.50	52.59	923.66					
	223.90	4,486.33	8,726.68					5,378.90
		301.51	2,442.53					900.00
								4,169.72
	291.01	1,818.87	6,285.83					
		542.00	2,754.14					3,373.03
	139.85	742.86	7,222.12					4,918.21
		697.00	252.48					

Statement of disbursements made from the appropriations for the Indian

Heads of appropriations.	OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.				
	Pay of temporary employés at agencies.	Support of schools.	To promote civilization among Indians generally, including Indian labor.	Traveling expenses of Indian agents.	Traveling expenses of special agents.
***Miscellaneous Support—Gratuities*—Continued.**	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
Sioux of Lake Traverse, 1891			2,155.00		
S'Klallams, 1891			48.00		
Tonkawas	87.00				
Walla Walla, Cayuse, and Umatilla tribes, 1891			402.05		
Yakimas and other Indians, 1891			2,263.85		
General Incidental Expenses, Indian Service.					
Arizona, employés, 1891			1,210.00		
Arizona, including support and civilization, 1891				149.80	
California, employés, 1891	82.80		1,024.05		
California, including support and civilization, 1891	26.50			740.84	
Colorado, 1891				292.30	
North Dakota, 1891				157.90	
South Dakota, 1891				1,158.15	
Idaho, 1891				142.70	
Montana, 1891				823.27	
Nevada, employés, 1891	30.00				
Nevada, including support and civilization, 1891			200.00	299.50	
New Mexico, including employés and support and civilization, 1891				666.74	
Oregon, employés, 1891	35.00		1,588.25		
Oregon, including support and civilization, 1891			1,030.86	53.80	
Utah, including employés and support and civilization, 1891			850.00	77.95	
Washington, including employés and support and civilization, 1891	186.00		780.00	948.15	
Wyoming, 1891					
Indian Schools.					
Indian schools, support, 1891		772,833.41			
Indian schools, stock cattle		8,212.85			
Indian schools in States, support, 1891		75,000.00			
Indian school, transportation, 1891		28,372.87			
Indian school buildings		125,000.00			
Indian school, Albuquerque, N. Mex., support, 1891		45,434.29			
Indian school, Banning, Cal., support, 1891		9,670.37			
Indian school, Blackfeet Agency, support, 1891		8,583.48			
Indian school, Carlisle, Pa., support, 1891		110,935.08			
Indian school, Carson City, Nev., support, 1891		24,999.60			
Indian school, Cherokee, N. C., support, 1891		13,360.00			
Indian school, Chillocco, Ind. T., support, 1891		49,705.07			
Indian school, Clontarf, Minn., support, 1891		12,814.53			
Indian school, Genoa, Nebr., support, 1891		44,952.86			
Indian school, Grand Junction, Colo., support, 1891		32,664.51			
Indian school, Hampton, Va., support, 1891		19,117.08			
Indian school, Lawrence, Kans., support, 1891		107,416.68			
Indian school, Lincoln Institution, Philadelphia, Pa., support, 1891		32,871.00			
Indian school, Pierre, S. Dak., support, 1891		35,000.00			
Indian school, Rensselaer, Ind., support, 1891		6,247.80			
Indian school, St. Ignatius Mission, Mont., support, 1891		41,963.14			
Indian school, Salem, Oregon, support, 1891		60,787.77			
Indian school, Santa Fé, N. Mex., support, 1891		23,417.34			
Indian school, Wabash, Ind., support, 1891		10,020.00			
Indian schools in Minnesota for Chippewas, support, 1891		14,600.13			
Indian school buildings, Carlisle, Pa		10,000.00			
Indian school buildings, Flandreau, S. Dak					
Indian school buildings, Shoshone Reservation, Wyo					
Indian school buildings for Sioux Nations		2,000.00			

Department for the fiscal year ending June 30, 1891—Continued.

OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.								Total amount expended from each appropriation.	Balance unexpended.
Incidental expenses of agencies.	Pay of Indian police, scouts, and equipments.	Survey of Indian reservations.	Pay and expenses of Indian inspectors.	Expenses of Indian commissioners.	Stock cattle.	Miscellaneous.	In hands of agents.		
Dollars.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
.....	.....	.....	.....	.....	.....	.....	.....	5,986.50	13.50
.....	.....	.....	.....	.....	.....	.....	.....	1,348.00	2,652.00
.....	.....	.....	.....	.....	.....	.....	.....	3,300.92	1,699.08
.....	.....	.....	.....	.....	.....	.....	.....	5,693.34	806.66
42.00	.....	.....	.....	.....	.....	.....	.....	9,362.28	637.72
.....	.....	.....	.....	.....	.....	.....	.....	7,524.11	475.89
.....	.....	.....	.....	.....	.....	329.56	49.40	9,662.87	2,287.73
.....	.....	.....	.....	.....	.....	.....	.....	8,874.25	125.75
509.25	.....	.....	.....	.....	.....	.....	221.60	17,452.60	325.80
168.17	.....	.....	.....	.....	.....	.....	.....	760.47	739.53
327.80	.....	.....	.....	.....	.....	.....	.....	1,500.00	.....
1,136.32	.....	.....	.....	.....	.....	33.25	45.00	3,071.78	383.22
152.05	.....	.....	.....	.....	.....	.....	.....	480.98	519.02
593.77	.....	.....	.....	.....	.....	.....	41.50	2,398.79	1,559.71
.....	.....	.....	.....	.....	.....	.....	.....	5,408.90	591.10
297.60	.....	.....	.....	.....	.....	.....	.....	14,234.01	2,265.99
212.40	.....	.....	.....	.....	.....	.....	108.35	4,523.18	368.47
.....	.....	.....	.....	.....	.....	.....	.....	5,792.97	207.03
121.50	.....	.....	.....	.....	.....	.....	.....	9,601.87	398.13
469.15	.....	.....	.....	.....	.....	.....	.....	7,566.27	433.73
366.20	.....	.....	.....	.....	.....	61.00	.....	15,364.39	635.61
49.52	.....	.....	.....	.....	.....	.....	.....	999.00	1.00
.....	.....	.....	.....	.....	.....	.....	2,320.95	772,833.41	1,715.64
.....	.....	.....	.....	.....	.....	.....	.....	8,212.85	1,787.15
.....	.....	.....	.....	.....	.....	.....	.....	75,000.00	.....
.....	.....	.....	.....	.....	.....	.....	300.00	28,372.87	11,327.13
.....	.....	.....	.....	.....	.....	.....	.....	125,000.00	.....
.....	.....	.....	.....	.....	.....	.....	.....	45,434.29	1,065.71
.....	.....	.....	.....	.....	.....	.....	.....	9,670.37	2,329.63
.....	.....	.....	.....	.....	.....	.....	.....	8,683.48	3,816.52
.....	.....	.....	.....	.....	.....	.....	.....	110,935.08	64.92
.....	.....	.....	.....	.....	.....	.....	.....	24,999.60	.40
.....	.....	.....	.....	.....	.....	.....	.....	13,360.00	.....
.....	.....	.....	.....	.....	.....	.....	.....	49,705.07	294.93
.....	.....	.....	.....	.....	.....	.....	.....	12,814.53	2,185.47
.....	.....	.....	.....	.....	.....	.....	.....	44,952.86	5,047.14
.....	.....	.....	.....	.....	.....	.....	.....	32,664.51	2,335.49
.....	.....	.....	.....	.....	.....	.....	.....	19,117.08	922.92
.....	.....	.....	.....	.....	.....	.....	.....	107,416.68	15,083.32
.....	.....	.....	.....	.....	.....	.....	.....	32,871.00	529.00
.....	.....	.....	.....	.....	.....	.....	.....	35,000.00	.....
.....	.....	.....	.....	.....	.....	.....	.....	6,247.80	2,082.20
.....	.....	.....	.....	.....	.....	.....	.....	41,963.14	3,036.86
.....	.....	.....	.....	.....	.....	.....	.....	60,787.77	9,962.23
.....	.....	.....	.....	.....	.....	.....	84.92	23,417.34	1,497.74
.....	.....	.....	.....	.....	.....	.....	.....	10,020.00	.....
.....	.....	.....	.....	.....	.....	.....	.....	14,600.13	399.87
.....	.....	.....	.....	.....	.....	.....	.....	10,000.00	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	25,000.00
.....	.....	.....	.....	.....	.....	.....	.....	.....	25,000.00
.....	.....	.....	.....	.....	.....	.....	.....	2,000.00	13,000.00

Statement of disbursements made from the appropriations for the Indian

Heads of appropriations.	Amount appropriated.	OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.			
		Pay of Indian agents.	Pay of special agents.	Pay of interpreters.	Buildings at agencies, and repairs.
Miscellaneous.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
Pay of farmers, 1891	60,000.00				
Pay of Indian police, 1891	123,000.00				
Pay of judges, Indian courts, 1891	10,000.00				
Pay of matrons, 1891	623.34				
Telegraphing and purchase of Indian supplies, 1891	45,000.00				
Transportation of Indian supplies, 1891	290,000.00				
Vaccination of Indians, 1891	1,000.00				
Surveying and allotting Indian reservations, 1891	10,000.00				
Advance interest to Sioux Nation, reimbursable	150,000.00				
Civilization and support of Sioux, Medawakanton band	8,000.00				
Commission to negotiate with Cherokees and other Indians	20,000.00				
Commission to negotiate with Chippewas in North Dakota and Minnesota	5,000.00				
Commission to negotiate with Northern Cheyennes	5,000.00				
Commission, Puyallup Reservation	10,000.00				
Commission, Warm Springs and Colville Reservations	6,000.00				
Counsel for Mission Indians of South California	2,500.00				
Ditches and reservoirs for Navajoes	7,500.00				
Investigating Indian depredation claims	20,000.00				
Negotiating with Creeks for cession of lands to Seminoles	32,250.00				
Negotiating with Indian tribes, act Feb. 8, 1887	5,000.00				
New allotments, under act of Feb. 8, 1887, reimbursable	30,000.00				
Payment to Absentee Shawnees, Big Jim's band	17,215.00				
Payment to Chippewas of Minnesota, for damages	150,000.00				
Payment to Creek Nation, 3d article treaty, Aug. 11, 1866	400,000.00				
Payment to George M. Chapman	424.40				
Payment to Kickapoo citizens	8,783.58				
Payment to Mexican Pottawatomies	17,995.46				
Payment to Pottawatomies for Fitchie's bond	2,100.00				
Payment to Santee Sioux, Flandreau, S. Dak., reimbursable	45,000.00				
Payment to Senecas for lands	1,405.66				
Relief and civilization of Chippewas in Minnesota, reimbursable	100,000.00				
Relief of destitute Indians	25,000.00				
Standard samples, Indian service	1,500.00				
Surveying and alloting for Chippewas in Minnesota, reimbursable	100,000.00				
Unfinished allotments, under act of Feb. 8, 1887, reimbursable	10,000.00				

Department for the fiscal year ending June 30, 1891—Continued.

OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.

Vaccination of Indians.	Medicines and medical supplies.	Subsistence supplies.	Annuity goods, agricultural and miscellaneous supplies.	Expenses of transportation and storage.	Purchase and inspection of annuity goods and supplies.	Advertising expenses and telegraphing.	Payments of annuities in money.	Pay of regular employés at agencies.
Dollars.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
								55,446.09
					85,847.79	9,150.52		
156.00				264,200.93				
							400,000.00	
							8,783.58	
							42,000.00	
							1,405.66	
		6,244.54	22,443.69					1,660.00
		11,263.48						

Statement of disbursements made from the appropriations for the Indian

Heads of appropriations.	OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.				
	Pay of temporary employés at agencies.	Support of schools.	To promote civilization among Indians generally, including Indian labor.	Traveling expenses of Indian agents.	Traveling expenses of special agents.
Miscellaneous.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
Pay of farmers, 1891					
Pay of Indian police, 1891					
Pay of judges, Indian courts, 1891					
Pay of matrons, 1891		116.50			
Telegraphing and purchase of Indian supplies, 1891					
Transportation of Indian supplies, 1891					
Vaccination of Indians, 1891					
Surveying and allotting Indian reservations, 1891					
Advance interest to Sioux Nation, reimbursable					
Civilization and support of Sioux, Medawakanton band					
Commission to negotiate with Cherokees and other Indians					
Commission to negotiate with Chippewas in North Dakota and Minnesota					
Commission to negotiate with Northern Cheyennes					
Commission, Puyallup Reservation					
Commission, Warm Springs and Colville Reservation					
Counsel for Mission Indians of South California					
Ditches and reservoirs for Navajoes					
Investigating Indian depredation claims					
Negotiating with Creeks for cession of lands to Seminoles					
Negotiating with Indian tribes, act Feb. 8, 1887					
New allotments, under act of Feb. 8, 1887, reimbursable					
Payment to Absentee Shawnees, Big Jim's band					
Payment to Chippewas of Minnesota, for damages					
Payment to Creek Nation, 3d article treaty, Aug. 11, 1866					
Payment to George M. Chapman					
Payment to Kickapoo citizens					
Payment to Mexican Pottawatomies					
Payment to Pottawatomies for Fitche's bond					
Payment to Santee Sioux, Flandreau, S. Dak., reimbursable					
Payment to Senecas for lands					
Relief and civilization of Chippewas in Minnesota, reimbursable	185.25	6,790.23	9,442.75		
Relief of destitute Indians					
Standard samples, Indian service					
Surveying and allotting for Chippewas in Minnesota, reimbursable					
Unfinished allotments, under act of Feb. 8, 1887, reimbursable					

Department for the fiscal year ending June 30, 1891—Continued.

OBJECTS AND PURPOSES FOR WHICH THE APPROPRIATIONS HAVE BEEN EXPENDED.								Total amount expended from each appropriation.	Balance unexpended.
Incidental expenses of agencies.	Pay of Indian police, scouts, and equipments.	Survey of and allotments on Indian reservations.	Pay and expenses of Indian inspectors.	Expenses of Indian commissioners.	Stock cattle.	Miscellaneous.	In hands of agents.		
Dollars.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
.....	.....	.....	.....	.....	.....	.....	.....	55,446.09	4,553.91
.....	116,709.71	.....	.....	.....	.....	.....	.....	116,709.71	6,290.29
.....	.....	.....	.....	.....	6,953.38	.....	.....	6,953.38	3,046.62
.....	.....	.....	.....	.....	.....	.....	.....	116.50	506.84
.....	.....	.....	.....	.....	.....	.....	.....	44,998.31	1.69
.....	.....	.....	.....	.....	.....	.....	.....	264,200.93	25,799.07
.....	.....	.....	.....	.....	.....	.....	.....	156.00	844.00
.....	.....	5,919.50	.....	.....	.....	.....	.....	5,919.50	4,080.50
.....	.....	.....	.....	.....	.....	.....	.....	.....	150,000.00
.....	.....	.....	.....	.....	.....	.....	.....	.....	8,000.00
.....	.....	.....	.....	.....	.....	20,000.00	.....	20,000.00	.....
.....	.....	.....	.....	.....	.....	4,093.76	.....	4,093.76	906.24
.....	.....	.....	.....	.....	.....	3,000.00	.....	3,000.00	2,000.00
.....	.....	.....	.....	.....	.....	7,172.78	.....	7,172.78	2,827.22
.....	.....	.....	.....	.....	.....	6,000.00	.....	6,000.00	.....
.....	.....	.....	.....	.....	.....	2,500.00	.....	2,500.00	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	7,500.00
.....	.....	.....	.....	.....	.....	15,033.78	.....	15,033.78	4,966.22
.....	.....	.....	.....	.....	.....	.....	.....	.....	32,250.00
.....	.....	.....	.....	.....	.....	.....	.....	.....	5,000.00
.....	.....	.....	.....	.....	.....	.....	.....	.....	30,000.00
.....	.....	.....	.....	.....	.....	3,443.00	.....	3,443.00	13,772.00
.....	.....	.....	.....	.....	.....	.....	.....	.....	150,000.00
.....	.....	.....	.....	.....	.....	.....	.....	400,000.00	.....
.....	.....	.....	.....	.....	.....	424.40	.....	424.40	.....
.....	.....	.....	.....	.....	.....	.....	.....	8,783.58	.....
.....	.....	.....	.....	.....	.....	1,799.55	.....	1,799.55	16,195.91
.....	.....	.....	.....	.....	.....	.....	.....	.....	2,100.00
.....	.....	.....	.....	.....	.....	.....	.....	42,000.00	3,000.00
.....	.....	.....	.....	.....	.....	.....	.....	1,405.66	.....
.....	.....	.....	.....	.....	.....	80.00	.....	46,847.48	53,152.54
.....	.....	.....	.....	.....	.....	.....	.....	11,263.48	13,736.52
.....	.....	.....	.....	.....	.....	.....	.....	.....	1,500.00
.....	.....	4,364.78	.....	.....	.....	.....	.....	4,364.78	95,635.22
.....	.....	10,000.00	.....	.....	.....	.....	.....	10,000.00	.....

Statement of the salaries and incidental expenses paid at each agency in the Indian service number of Indians

Names of agencies.	State or Territory.	Number of Indians at each agency.	Appropriations from which salaries of employés and incidental expenses of agencies have been paid.
Grand total			
Blackfeet	Montana	1,953	Incidentals in Montana, 1891 Fulfilling treaties with Indians, Blackfeet Agency.
Cheyenne and Arapahoe.	Oklahoma	3,269	Contingencies, Indian Department, 1891 Support of Cheyennes and Arapahoes, employés, 1891. Support of Arapahoes, Cheyennes, Apaches, Kiowas, Comanches, and Wichitas, 1891.
Cheyenne River	South Dakota	2,569	Incidentals in South Dakota, 1891 Support of Sioux of different tribes, employés, 1891. Support of Sioux of different tribes, subsistence and civilization, 1891.
Colorado River	Arizona	624	Incidentals in Arizona, employés, 1891 Incidentals in Arizona, including support and civilization, 1891.
Colville	Washington	2,526	Incidentals in Washington, including employés and support and civilization, 1891. Support of Columbias and Colvilles, 1891 Support of Nez Percés, Joseph's band, 1891
Crow	Montana	2,214	Contingencies, Indian Department, 1891 Incidentals in Montana, 1891 Support of Crows, employés, 1891
Crow Creek and Lower Brulé.	South Dakota	2,142	Incidentals in South Dakota, 1891 Support of Sioux of different tribes, employés, 1891. Support of Sioux of different tribes, subsistence and civilization, 1891.
Devils Lake	North Dakota	3,174	Incidentals in North Dakota, 1891 Support of Sioux of Devils Lake, 1891 Support of Chippewas, Turtle Mountain band, 1891.
Eastern Cherokee	North Carolina	*3,000	Contingencies, Indian Department, 1891
Flathead	Montana	1,788	Incidentals in Montana, 1891 Support of Flatheads and other confederated tribes, 1891. Support of Flatheads, Carlos band, 1891
Fort Belknap	....do	1,727	Incidentals in Montana, 1891 Fulfilling treaties with Indians at Fort Belknap.
Fort Berthold	North Dakota	1,112	Incidentals in North Dakota, 1891 Contingencies, Indian Department, 1891 Support of Arickarees, Gros Ventres, and Mandans, 1891.
Fort Hall	Idaho	1,403	Incidentals in Idaho, 1891 Support of Bannocks, employés, 1891 Support of Indians, Fort Hall Reservation, 1891.
Fort Peck	Montana	1,971	Incidentals in Montana, 1891 Fulfilling treaties with Indians, Fort Peck Agency.
Green Bay	Wisconsin	3,103	Contingencies, Indian Department, 1891 Support of Menomonees, 1891
Grande Ronde	Oregon	369	Support of Molels, 1891 Incidentals in Oregon, employés, 1891 Incidentals in Oregon, including support and civilization, 1891.
Hoopa Valley	California	492	Incidentals in California, employés, 1891 Incidentals in California, including support and civilization, 1891.
Kiowa	Oklahoma	4,166	Contingencies, Indian Department, 1891 Support of Apaches, Kiowas, and Comanches, employés, 1891. Support of Arapahoes, Cheyennes, Apaches, Kiowas, Comanches, and Wichitas, 1891.
Klamath	Oregon	975	Support of Indians, Klamath Agency, 1891 Incidentals in Oregon, including support and civilization, 1891.
La Pointe	Wisconsin	4,930	Contingencies, Indian Department, 1891 Buildings at agencies and repairs, 1891 Support of Chippewas of Lake Superior, 1891
Lemhi	Idaho	.492	Incidentals in Idaho, 1891 Support of Indians at Lemhi Agency, 1891

*Last year.

during the year ending June 30, 1891, showing the appropriations from which paid and the at each agency.

INCIDENTAL EXPENSES.				Total incidental expenses.	PAY OF EMPLOYÉS.		Total pay of employés.
Traveling expenses of agents.	Office rent, fuel, light, and stationery.	Forage and stable expenses.	Miscellaneous.		Regular.	Temporary.	
$8,808.35	$2,297.16	$23,873.42	$7,605.65	$42,584.58	$256,908.40	$4,489.49	$261,397.99
62.00	.....	.....	83.82	145.82	.....	.....	.....
.....	.....	500.00	31.35	531.35	3,113.20	336.00	3,449.20
29.20	.....	.....	6.00	35.20	.....	.....	.....
.....	.....	.....	.....	.....	3,100.00	.....	3,100.00
.....	.....	.....	.....	.....	1,120.00	19.37	1,139.37
45.90	.....	.....	350.70	396.60	.....	.....	.....
.....	.....	.....	.....	.....	1,836.19	.....	1,836.19
.....	.....	1,896.49	.....	1,896.49	7,642.03	.....	7,642.03
.....	.....	.....	.....	.....	2,636.95	.....	2,636.95
.....	.....	345.80	53.00	398.80	.....	.....	.....
567.30	.....	599.66	193.80	1,360.76	3,286.71	186.00	3,472.71
.....	.....	.....	.....	.....	4,125.79	.....	4,125.79
.....	.....	.....	.....	.....	.....	22.50	22.50
.....	.....	.....	.....	.....	900.00	.....	900.00
403.55	.....	.....	.....	403.55	.....	.....	.....
.....	.....	.....	.....	.....	4,049.91	.....	4,049.91
248.51	.....	175.75	335.80	760.06	.....	.....	.....
.....	.....	.....	.....	.....	8,189.19	.....	8,189.19
.....	.....	286.95	.....	286.95	4,968.21	24.00	4,992.21
73.95	.....	76.00	24.45	174.40	.....	.....	.....
.....	.....	.....	.....	.....	1,608.33	.....	1,608.33
.....	.....	.....	.....	.....	105.00	.....	105.00
12.30	25.00	.....	25.75	63.05	.....	.....	.....
208.40	.....	.....	317.95	526.35	.....	.....	.....
.....	.....	.....	.....	.....	1,560.00	.....	1,560.00
.....	.....	.....	.....	.....	3,300.00	.....	3,300.00
44.15	.....	.....	13.50	57.65	.....	.....	.....
.....	.....	1,374.00	18.00	1,392.00	6,450.00	99.00	6,549.00
83.95	.....	445.00	203.35	732.30	.....	.....	.....
84.30	.....	64.70	149.00	298.00	.....	.....	.....
.....	.....	1,329.06	.....	1,329.06	5,302.21	.....	5,302.21
24.20	.....	.....	99.55	123.75	.....	.....	.....
.....	.....	.....	.....	.....	3,973.00	.....	3,973.00
.....	.....	250.00	.....	250.00	750.00	.....	750.00
36.52	.....	.....	42.10	78.62	.....	.....	.....
.....	.....	.....	.....	.....	7,520.00	.....	7,520.00
44.80	.....	48.73	82.52	176.05	300.00	18.50	318.50
.....	.....	96.00	.....	96.00	2,407.72	.....	2,407.72
.....	.....	.....	.....	.....	445.27	.....	445.27
.....	.....	.....	.....	.....	2,209.72	.....	2,209.72
.....	.....	299.93	12.00	311.93	.....	.....	.....
.....	.....	.....	.....	.....	3,087.40	82.80	3,170.20
72.05	.....	.....	5.00	77.05	.....	.....	.....
.....	.....	.....	7.50	7.50	.....	.....	.....
.....	.....	.....	.....	.....	5,488.88	.....	5,488.88
.....	.....	1,808.00	.....	1,808.00	4,165.38	.....	4,165.38
.....	.....	243.04	20.00	263.04	2,023.37	.....	2,023.37
40.80	.....	.....	8.00	48.80	.....	.....	.....
282.17	.....	87.67	119.40	489.24	.....	.....	.....
.....	600.00	.....	.....	600.00	.....	.....	.....
.....	.....	71.70	.....	71.70	2,350.00	200.00	2,550.00
66.00	.....	.....	3.00	69.00	.....	.....	.....
.....	175.00	630.00	.....	805.00	2,534.89	410.00	2,944.89

Statement of the salaries and incidental expenses paid at each agency in

Names of agencies.	State or Territory.	Number of Indians at each agency.	Appropriations from which salaries of employés and incidental expenses of agencies have been paid.
Mackinac	Michigan	*6,077	Contingencies, Indian Department, 1891
			Buildings at agencies and repairs, 1891
Mescalero	New Mexico	531	Incidentals in New Mexico, including employés and support and civilization, 1891.
			Support of Indians in Arizona and New Mexico, 1891.
Mission and Tule River	California	*4,056	Incidentals in California, employés, 1891
			Buildings at agencies and repairs, 1891
			Incidentals in California, including support and civilization, 1891.
Navajo	New Mexico	*17,200	Support of Navajoes, 1891
			Incidentals in New Mexico, including employés, and support and civilization, 1891.
			Incidentals in Arizona, including support and civilization, 1891.
Neah Bay	Washington	694	Support of Makahs, 1891
			Incidentals in Washington, including employés and support and civilization, 1891.
Nevada	Nevada	1,002	Incidentals in Nevada, employés, 1891
			Incidentals in Nevada, including support and civilization, 1891.
New York	New York	5,337	Buildings at agencies and repairs, 1891
			Contingencies, Indian Department, 1891
Nez Percé	Idaho	1,700	Support of Nez Percés in Idaho, 1891
			Support of Nez Percés, employés, 1891
			Support of Nez Percés, Joseph's band, 1891
			Incidentals in Idaho, 1891
Omaha and Winnebago	Nebraska	2,367	Contingencies, Indian Department, 1891
			Fulfilling treaties with Winnebagoes
Osage	Oklahoma	1,759	Contingencies, Indian Department, 1891
			Support of Kansas Indians, 1891
Pima	Arizona	9,695	Incidentals in Arizona, employés, 1891
			Incidentals in Arizona, including support and civilization, 1891.
Pine Ridge	South Dakota	6,088	Incidentals in South Dakota, 1891
			Contingencies, Indian Department, 1891
			Support of Sioux of different tribes, employés, 1891.
			Support of Sioux of different tribes, subsistence and civilization, 1891.
Ponca, Pawnee, Otoe, and Oakland.	Oklahoma	1,828	Contingencies, Indian Department, 1891
			Support of Poncas, 1891
			Support of Tonkawas, 1891
			Support of Pawnees, employés, 1891
			Fulfilling treaties with Otoes and Missourias
Pottawatomie and Great Nemaha.	Kansas	1,065	Contingencies, Indian Department, 1891
			Fulfilling treaties with Iowas
			Fulfilling treaties with Kickapoos
Pueblo	New Mexico	8,120	Buildings at agencies and repairs, 1891
			Incidentals in New Mexico, including employés and support and civilization, 1891.
Puyallup (consolidated)	Washington	1,816	Support of Quinaielts and Quillehutes, 1891
			Support of S'Klallams, 1891
			Incidentals in Washington, including employés and support and civilization, 1891
Quapaw	Indian Territory	1,289	Fulfilling treaties with Senecas, employés
			Support of Quapaws, employés, 1891
			Support of Modocs in Indian Territory, 1891
			Contingencies, Indian Department, 1891
Round Valley	California	564	Incidentals in California, employés, 1891
			Incidentals in California, including support and civilization, 1891.
Rosebud	South Dakota	4,723	Incidentals in South Dakota, 1891
			Support of Sioux of different tribes, employés, 1891.
			Support of Sioux of different tribes, subsistence and civilization, 1891.
Sac and Fox	Oklahoma	2,206	Contingencies, Indian Department, 1891
			Support of Kickapoos, 1891
Sac and Fox	Iowa	390	Contingencies, Indian Department, 1891
			Buildings at agencies and repairs, 1891
San Carlos	Arizona	*4,819	Support of Indians in Arizona and New Mexico, 1891.
			Incidentals in Arizona, including support and civilization, 1891.
Santee	Nebraska	1,399	Support of Sioux of different tribes, employés, 1891.
			Support of Poncas, 1891

*Last year.

the Indian service during the fiscal year ending June 30, 1891, etc.—Continued.

INCIDENTAL EXPENSES.				Total incidental expenses.	PAY OF EMPLOYÉS.		Total pay of employés.
Traveling expenses of agents.	Office rent, fuel, light, and stationery.	Forage and stable expenses.	Miscellaneous.		Regular.	Temporary.	
					$700.00		$700.00
	$100.00			$100.00			
$104.95			$14.20	119.15			
		$173.40		173.40	4,017.55		4,017.55
					1,200.00		1,200.00
	240.00			240.00			
645.79		109.20	488.00	1,242.99		$26.50	26.50
		75.68		75.68	3,823.04		3,823.04
210.30		565.00	29.75	805.05			
86.00			305.06	391.06			
					1,000.00		1,000.00
54.00		170.00	16.00	240.00			
					5,378.90	30.00	5,408.90
166.10		211.29	259.60	636.90			
	36.66			36.66			
148.73			17.40	166.13	598.91	137.50	736.41
		248.38		248.38	598.26		598.26
					4,011.26	195.00	4,206.26
					350.22		350.22
52.50			49.50	102.00			
47.35		345.00	148.75	541.10		255.00	255.00
		200.00		200.00	6,400.00	206.12	6,606.12
142.71			3.50	146.21			
		43.00		43.00	1,110.06		1,110.06
					3,677.16		3,677.16
63.80		497.98	114.73	676.46			
127.92			182.95	310.87			
			277.02	277.02			
					5,951.10		5,951.10
		1,120.00		1,120.00	2,805.00	454.80	3,259.80
55.76			148.00	203.76	920.87		920.87
		64.98		64.98	2,193.36	15.00	2,208.36
					720.00	87.00	807.00
					4,252.64		4,252.64
					3,744.54		3,744.54
142.28	57.50	116.87		316.65			
					1,206.32		1,206.32
					1,784.67	43.50	1,828.17
	450.00			450.00			
223.61		80.00	113.45	517.06	900.00		900.00
					1,845.65		1,845.65
					1,300.00		1,300.00
236.10			181.55	417.65	1,631.50		1,631.50
					470.00		470.00
					193.75		193.75
		210.00		210.00	1,000.00	87.20	1,087.20
110.17		150.00	298.84	559.01	2,000.00		2,000.00
					3,480.00		3,480.00
23.00			16.25	39.25			
330.80			66.37	447.17			
					2,965.75		2,965.75
		890.00	284.00	1,174.00	6,072.18		6,072.18
200.70			279.64	480.34	1,300.00	64.00	1,364.00
					1,700.00		1,700.00
319.50	18.00	36.55	52.25	426.30			
	75.00			75.00			
		1,423.37		1,423.37	7,710.68	180.00	7,890.68
		157.50		157.50			
					3,541.03		3,541.03
					150.00		150.00

Statement of the salaries and incidental expenses paid at each agency in

Names of agencies.	State or Territory.	Number of Indians at each agency.	Appropriations from which salaries of employés and incidental expenses of agencies have been paid.
Santee	Nebraska		Support of Sioux of different tribes, subsistence and civilization, 1891.
			Contingencies Indian Department, 1891
Shoshone	Wyoming	1,732	Support of Northern Cheyennes and Arapahoes, employés, 1891.
			Support of Shoshones, employés, 1891
			Incidentals in Wyoming, 1891
			Contingencies Indian Department, 1891
Siletz	Oregon	560	Incidentals in Oregon, employés, 1891
			Incidentals in Oregon, including support and civilization, 1891.
Sisseton	South Dakota	1,730	Incidentals in South Dakota, 1891
			Support of Sioux of Lake Traverse, 1891
Southern Ute and Jicarilla.	Colorado and New Mexico.	1,802	Support of confederated bands of Utes, employés, 1891.
			Support of Indians in Arizona and New Mexico, 1891.
			Incidentals in New Mexico, including employés, and support and civilization, 1891.
			Incidentals in Colorado, 1891
			Incidentals in New Mexico, 1891
			Buildings at agencies and repairs, 1891
Standing Rock	North Dakota	3,960	Incidentals in North Dakota, 1891
			Contingencies Indian Department, 1891
			Support of Sioux of different tribes, employés, 1891.
			Support of Sioux of different tribes, subsistence and civilization, 1891.
Tongue River	Montana	916	Incidentals in Montana 1891
			Support of Northern Cheyennes and Arapahoes, employés, 1891.
Tulalip	Washington	1,217	Contingencies Indian Department, 1891
			Support of D'Wamish and other allied tribes, 1891.
			Incidentals in Washington, including employés, and support and civilization, 1891.
Uintah and Ouray	Utah	1,868	Incidentals in Utah, including employés, and support and civilization, 1891.
			Support of confederated bands of Utes, employés, 1891.
Umatilla	Oregon	997	Incidentals in Oregon, including support and civilization, 1891.
			Support of Walla Walla, Cayuse, and Umatilla tribes, 1891.
Union	Indian Territory	*67,000	Buildings at agencies and repairs, 1891
			Contingencies Indian Department, 1891
Warm Springs	Oregon	900	Support of confederated tribes and bands in middle Oregon, 1891.
			Incidentals in Oregon, including support and civilization, 1891.
Western Shoshone	Wyoming	590	Incidentals in Nevada, including support and civilization, 1891.
			Support of Shoshones in Nevada, 1891
White Earth	Minnesota	*6,408	Support of Chippewas, Red Lake, and Pembinas, 1891.
			Support of Chippewas of White Earth Reservation, 1891.
			Contingencies Indian Department, 1891
Yakama	Washington	1,434	Support of Yakamas and other Indians, 1891
			Incidentals in Washington, including employés, and support and civilization, 1891.
Yankton	South Dakota	1,716	Incidentals in South Dakota, 1891
			Support of Sioux of Yankton tribe, 1891

*Last year.

the Indian service during the fiscal year ending June 30, 1891, etc.—Continued.

INCIDENTAL EXPENSES.				Total incidental expenses.	PAY OF EMPLOYÉS.		Total pay of employés.
Traveling expenses of agents.	Office rent, fuel, light, and stationery.	Forage and stable expenses.	Miscellaneous.		Regular.	Temporary.	
.....	.....	$445.35	.....	$445.35	$2,850.00	.....	2,850.00
$175.00	.....	.....	$161.45	336.45	.....	.....	.....
.....	.....	.....	.....	.....	3,799.97	$40.00	3,839.97
.....	.....	.....	.....	.....	4,224.00	.....	4,224.00
.....	.....	252.48	59.52	312.00	.....	.....	.....
.....	.....	.....	148.50	148.50	.....	.....	.....
.....	.....	.....	.....	.....	1,900.00	35.00	1,935.00
13.00	.....	.....	51.00	64.00	.....	.....	.....
68.75	.....	.....	3.75	72.50	.....	.....	.....
.....	.....	.....	.....	.....	1,505.38	.....	1,505.38
.....	.....	.....	.....	.....	3,464.57	.....	3,464.57
.....	.....	.....	.....	.....	4,636.37	.....	4,636.37
.....	.....	202.50	40.00	242.50	.....	.....	.....
292.30	.....	86.20	168.17	546.67	.....	.....	.....
.....	.....	72.00	.....	72.00	.....	.....	.....
.....	$120.00	.....	.....	120.00	.....	.....	.....
.....	.....	.....	100.00	100.00	.....	.....	.....
.....	.....	.....	30.95	30.95	.....	.....	.....
.....	.....	.....	.....	.....	3,225.00	.....	3,225.00
.....	.....	676.99	.....	676.99	3,050.00	.....	3,053.00
68.65	.....	698.33	136.40	903.38	.....	.....	.....
.....	.....	.....	.....	.....	2,863.75	.....	2,863.75
153.60	.....	.....	4.60	158.20	.....	.....	.....
.....	.....	134.48	.....	134.48	1,650.00	.....	1,650.00
70.75	.....	.....	35.85	106.60	.....	.....	.....
77.95	.....	1,825.99	409.15	2,313.09	3,373.03	.....	3,373.03
.....	.....	.....	.....	.....	8,082.40	.....	8,082.40
.....	.....	.....	22.00	22.00	.....	.....	.....
.....	.....	500.00	.....	500.00	3,022.20	.....	3,022.20
.....	400.00	.....	.....	400.00	.....	.....	.....
420.05	.....	.....	211.20	631.25	2,100.00	39.00	2,139.00
.....	.....	343.32	.....	343.32	2,415.76	.....	2,415.76
.....	.....	.....	28.50	28.50	.....	.....	.....
94.05	.....	156.25	38.00	288.30	.....	.....	.....
.....	.....	.....	.....	.....	1,989.12	.....	1,989.12
.....	.....	.....	.....	.....	2,912.64	.....	2,912.64
.....	.....	.....	.....	.....	2,008.54	.....	2,008.54
1,115.39	.....	.....	49.01	1,164.40	.....	1,135.70	1,135.70
.....	.....	217.01	42.00	259.01	2,357.07	.....	2,357.07
20.00	.....	.....	.....	20.00	.....	.....	.....
166.74	.....	300.00	230.20	696.94	.....	.....	.....
.....	.....	435.89	82.75	518.64	2,100.00	.....	2,100.00

52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { EX. DOC. No. 9.

JUDGMENTS AGAINST THE UNITED STATES.

LETTER

FROM

THE ATTORNEY-GENERAL,

TRANSMITTING

A report of the judgments against the United States rendered in the district and circuit courts since February 9, 1891.

JANUARY 5, 1892.—Referred to the Committee on Appropriations and ordered to be printed.

DEPARTMENT OF JUSTICE,
Washington, D. C., December 17, 1891.

SIR: In compliance with the provisions of section 11 of the act of Congress entitled "An act to provide for the bringing of suits against the Government of the United States," approved March 3, 1887, 24 Statutes at Large, p. 507, chap. 359, I have the honor to transmit herewith the report of the judgments rendered in the circuit and district courts of the United States since February 9, 1891, the date of my last report. Attention is called to the fact that although the costs of suit in many instances have been allowed by the court, the transcripts of the records as sent to this office do not disclose any costs to have been taxed.

Very respectfully,

W. H. H. MILLER,
Attorney-General.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

Judgments rendered against the United States.

	Judgment.	Costs.	Date of judg. ment.	Exhibit.
Paul Ravesies	$27.00	$35.85	July 24, 1888	1
Oregon Railway and Navigation Company	600.00	65.36	Mar. 30, 1891	2
Philip A. Hoyne	547.20	.....	May 23, 1889	3
E. W. Face	25.00	.....	Mar. 12, 1889	4
H. M. Dosk	.....	7.20	June 30, 1891	5
Samuel T. Poinier	271.65	31.95	Nov. 12, 1891	6
Abner H. Davis	141.65	.....	Jan. 19, 1891	7
Wells, Fargo & Co	1,280.20	.....	Jan. 31, 1891	8
James K. Clarke	120.00	.....	Apr. 30, 1891	9
Robert A. Torrey	357.50	65.80	Sept. 23, 1891	10
Henry O. Ewing	172.55	27.60	Sept. 25, 1891	11
A. J. Van Duzee	419.40	3.65	Oct. 19, 1891	12
James T. Carter	91.70	61.10	Oct. 1, 1891	13
George E. Bird	265.00	.....	Jan. 22, 1891	14
G. Van Hoorebeke	548.75	.....	May 22, 1891	15
Total	4,807.60	298.51		

EXHIBIT 1.

[Paul Ravesies *v.* United States, No. 115.]

The court, on due consideration of the premises, finds for the plaintiff, and doth order, adjudge, and decree that the said Paul Ravesies do have and recover of and from the United States the sum of $27, together with the costs of this suit.

HARRY TOULMIN, *Judge.*

Costs, $35.85.
July 24, 1888.
Southern district of Alabama.

EXHIBIT 2.

[The Oregon Railway and Navigation Company *v.* United States, No. 232.]

It is therefore considered that said plaintiff do have and recover of and from the defendant the sum of $600, together with its costs and disbursements herein taxed at ——— dollars.

Costs, $65.36.
March 30, 1891.
District of Oregon.

EXHIBIT 3.

[Philip A. Hoyne *v.* United States, No. 308.]

It is thereupon considered, adjudged, and decreed by the court that the plaintiff have and recover of and from the defendant the sum of $547.20, his damages, so as aforesaid found, together with his costs herein to be taxed.

May 23, 1889.
Northern district of Illinois.

EXHIBIT 4.

[E. W. Face *v.* United States, No. 376.]

On consideration whereof the court doth overrule the demurrer filed herein, and upon proof satisfactory to the court, doth adjudge, order, and decree that judgment be entered in favor of the petitioner against the United States for the sum of $25, with interest at the rate of 4 per centum per annum from the 2nd day of March, 1889, until paid, and the costs of this suit.

RO. W. HUGHES, *Judge.*

March 12, 1889.
Eastern District of Virginia.

EXHIBIT 5.

[H. M. Doak v. United States, No. 388.]

I do further certify that the cost was taxed by me, and that the services therein charged for were actually and necessarily rendered as therein stated, and that said cost remained unpaid.

E. R. CAMPBELL, *Clerk.*

Costs: $7.20.
June 30, 1891.
Middle District of Tennessee.

NOTE.—Judgment in this case was certified to Congress April 18, 1890, and an appropriation made therefor, but the costs have not heretofore been certified.

EXHIBIT 6.

[Samuel T. Poinier v. United States, No. 390.]

Ordered, adjudged, and decreed, that the judgment heretofore entered in this cause of date October 24, 1889, be and the same is hereby vacated, and that the plaintiff, Samuel Thane Poinier, have judgment against the United States in the sum of $271.65, with interest thereon from the 24th day of October, 1889, at the rate of 4 per cent per annum, until the time when the appropriation is made for the payment of this judgment and the costs of this action, amounting to the sum of $31.95, aggregating in the whole the sum of $303.60.

* * * * * * *

CHARLES H. SIMONTON, *U. S. Judge.*

November 12, 1891.
Western District of South Carolina.

EXHIBIT 7.

[Abner H. Davis v. United States, No. 595.]

It is therefore considered by the court here, to wit, on the 19th day of January, A. D. 1891, that the said petitioner, Abner H. Davis, recover of the said United States the sum of $141.65, debt or damages.

January 19, 1891.
District of Maine.

EXHIBIT 8.

[Wells, Fargo & Co., v United States, No. 602.]

Now therefore, by virtue of the law and by reason of the findings and opinion aforesaid, it is considered by the court, that Wells, Fargo, and Company, plaintiff, do have and recover of and from the United States of America, defendant, the sum of $1,280.20, together with legal interest thereon from January 6, 1888, to January 31, 1891, the date of this judgment, amounting to $275.04, and amounting in the aggregate, principal and interest, to the sum of $1,555.24.

January 31, 1891.
Northern District of California.

NOTE.—Interest amounting to $275.04 remitted this 4th day of April, A. D. 1891.

PILLSBURY & BLANDING,
Attorneys for Plaintiff.

EXHIBIT 9.

[James K. Clarke v. United States, No. 623.]

It is adjudged by the court, therefore, that the plaintiff do recover of the defendant the sum of $120 and the cost of suit.

EMORY SPEER, *U. S. Judge.*

April 30, 1891.
Southern District of Georgia.

EXHIBIT 10.

[Robert A. Torrey v. United States, No. 635.]

It is further considered and adjudged by the court that the plaintiff, Robert A. Torrey, have and recover of the United States the sum of $357.50, the damages aforesaid by the court assessed, and that a copy of this judgment and of the within findings of the court, together with its opinion thereon, be certified to the Attorney-General of the United States, pursuant to law.

———— ————.

September 23, 1891.

It is now further considered and adjudged by the court that in addition to said sum the plaintiff, Robert A. Torrey, have and recover of the defendant, the United States, the costs in this behalf expended, and that a copy of this judgment be certified to the Attorney-General, pursuant to law.
Costs: $65.80.

———— ————.

October 26, 1891.
Eastern district of Missouri.

EXHIBIT 11.

[Henry O. Ewing v. United States, No. 638.]

Now, therefore, in view of said decree, mandate action, and direction of the said Supreme Court of the United States and on consideration thereof, it is ordered, adjudged, and decreed that the original decree of this court be vacated, and that the said Henry O. Ewing have and recover from the United States the sum of $172.55, principal, with interest at 4 per cent per annum from this 25th day of September, 1891, until an appropriation is made for the payment of this judgment.

———— ————.

September 25, 1891.
Eastern district of Tennessee.

It appearing to the court that in rendering judgment in this cause on the 25th day of September, 1891, the court omitted to adjudge the costs of the cause * * * amounting to $27.60, the same being the clerk's fees in this, the district court, after issue was joined, and the same will be certified for allowance.

———— ————.

December 14, 1891.

EXHIBIT 12.

[A. J. Van Duzee v. United States, No. 799.]

And it is further ordered and adjudged by the court that in conformity to the said opinion of said Supreme Court, the plaintiff, A. J. Van Duzee, have and recover of and from the defendant, the United States of America, the sum of $419.40 and his costs, taxed at $3.65.

———— ————.

October 19, 1891.
Northern district of Iowa.

EXHIBIT 13.

[James T. Carter v. United States, No. 826.]

Now, therefore, in view of said decree, mandate, action, and direction of the said Supreme Court of the United States and on consideration thereof, it is ordered, adjudged, and decreed that the original decree of this court be vacated, and that the said James T. Carter have and recover from the United States the sum of $91.70, principal, with interest at 4 per cent per annum from this date until an appropriation is made for the payment of this judgment.

———— ————.

October 1, 1891.
Eastern district of Tennessee.

* * * It appearing to the court that, in rendering judgment in this cause on a former day of this present term, the court omitted to adjudge the costs of the cause, it is hereby ordered and adjudged that the said plaintiff have and recover of the United States the costs of the cause, amounting to $61.10, which will be certified for allowance.

———— ————.

December 1, 1891.

EXHIBIT 14.

[George E. Bird v. United States, No. 901.]

It is ordered that said demurrer be overruled, and that judgment be entered for said petitioner for the sum of $265. It is therefore, on the 22d day of January, A. D. 1891, considered by the court here that the said George E. Bird, petitioner, recover of the said United States the sum of $265, debt or damage.

———— ————.

District of Maine.

EXHIBIT 15.

[Gustavus Van Hoorebeke v. United States, No. 904.]

The petitioner having sustained the items of the bill of particulars by satisfactory proof, I am of opinion that a fair construction of the statute entitles him to judgment against the United States for $548.75 and costs.

———— ————

May 22, 1891.
Southern district of Illinois.

O

52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc No. 10.

LANDS OF THE CHEYENNE AND ARAPAHOES IN OKLAHOMA TERRITORY.

LETTER

FROM

THE SECRETARY OF THE INTERIOR,

IN RELATION TO

The allotment of lands to the Cheyenne and Arapahoes in Oklahoma Territory, and setting forth the necessity for an appropriation to complete the same.

JANUARY 5, 1892.—Referred to the Committee on Appropriations and ordered to be printed.

DEPARTMENT OF THE INTERIOR,
Washington, December 15, 1891.

SIR: I have the honor to invite your attention to that portion of my annual report for the past fiscal year in relation to the allotment of lands to the Cheyenne and Arapahoes in Oklahoma Territory, setting forth the necessity for an early appropriation of $15,000 to complete the same.

In the agreement made with these Indians in October, 1890, some 3,000,000 acres of valuable lands will be restored to the public domain.

Under last year's appropriation 1,808 of these Indians received allotments, leaving 1,564 yet to be provided for. The agreement with the Indians requires allotments to be made, and it will be to the best interests of the country that they be completed at the very earliest moment possible.

I have the honor, therefore, respectfully to urge upon Congress the passage of a bill or joint resolution providing means to complete this work at once.

I have the honor to be, very respectfully,

JOHN W. NOBLE,
Secretary.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { Ex. DOC. No. 11.

EXPENSES OF COLLECTING REVENUE FROM CUSTOMS.

LETTER

FROM

THE ACTING SECRETARY OF THE TREASURY,

TRANSMITTING

Estimates of appropriations for defraying the expenses of collecting the revenue from customs for the fiscal year ending June 30, 1893.

JANUARY 5, 1892.—Referred to the Committee on Appropriations and ordered to be printed.

TREASURY DEPARTMENT,
OFFICE OF THE SECRETARY,
Washington, D. C., December 15, 1891.

SIR: In accordance with the provisions of section 5 of the act of August 5, 1882 (22 Stat., p. 256), I have the honor to transmit herewith estimates of appropriations for defraying the expenses of collecting the revenue from customs for the fiscal year ending June 30, 1893.

Respectfully yours,

O. L. SPAULDING,
Acting Secretary.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, showing the number of employés and the salaries required for each collection district.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
MAINE.				
Port of Bangor, district of Bangor:				
Collector	1	.....	$3,000.00	$3,000.00
Deputy collector and inspector	1	.....	1,600.00	1,600.00
Do	1	$4.00	.....	1,460.00
Do	3	3.00	.....	3,285.00
Inspector	1	3.00	.....	1,095.00
Inspector and clerk	1	3.00	.....	1,095.00
Total	8	.....	.....	11,535.00

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum	
MAINE—continued.				
Port of Bath, district of Bath:				
Collector	1	.....	$3,000.00	$3,000.00
Deputy collector, inspector, weigher, gauger, and measurer	1	$4.00	.....	1,460.00
Do	1	3.00	.....	1,095.00
Inspector, weigher, gauger, measurer, and storekeeper	2	3.00	.....	2,190.00
Deputy collector and inspector	1	3.00	.....	1,095.00
Deputy collector	1	2.00	.....	730.00
Deputy collector and inspector	1	.....	720.00	720.00
Inspector	1	.95	.....	346.75
Do	1	.70	.....	255.50
Do	1	.05	.....	18.25
Total	11	.....	.....	10,910.50
Port of Belfast, district of Belfast:				
Collector	1	.....	1,200.00	1,200.00
Weigher, gauger, and measurer	1	2.50	.....	912.50
Deputy collector and inspector	1	2.00	.....	730.00
Do	1	.....	150.00	150.00
Do	1	.....	100.00	100.00
Total	5	.....	.....	3,092.50
Port of Castine, district of Castine:				
Collector	1	.....	700.00	700.00
Deputy collector and inspector	1	2.50	.....	912.50
Do	2	2.00	.....	1,460.00
Do	1	*1.65	.....	516.45
Total	5	.....	.....	3,588.95
Port of Eastport, district of Passamaquoddy:				
Collector	1	.....	3,000.00	3,000.00
Deputy collector and inspector	1	.....	1,600.00	1,600.00
Deputy collector	1	.....	1,200,00	1,200.00
Do	1	4.00	.....	1,460.00
Inspector	7	3.00	.....	7,665.00
Do	2	2.50	.....	1,825.00
Deputy collector and inspector	2	2.50	.....	1,825.00
Inspector, weigher, gauger, and measurer	1	2.50	.....	912.50
Inspector	4	2.00	.....	2,920.00
Total	20	.....	.....	22,407.50
Port of Ellsworth, district of Frenchman's Bay:				
Collector	1	.....	1,000.00	1,000.00
Deputy collector and inspector	1	.....	900.00	900.00
Do	1	.....	700.00	700.00
Do	1	2.00	.....	730.00
Do	1	1.65	.....	602.25
Storekeeper	1	.....	†50.00	50.00
Do	4	.....	†2.00	96.00
Total	10	.....	.....	4,078.25
Port of Houlton, district of Aroostook				
Collector	1	.....	1,500.00	1,500.00
Deputy collector and inspector	1	4.00	.....	1,460.00
Do	3	3.00	.....	3,285.00
Do	3	2.00	.....	2,190.00
Total	8	.....	.....	8,435.00
Port of Kennebunk, district of Kennebunk:				
Collector	1	.....	100.00	100.00
Deputy collector, inspector, weigher, gauger, and measurer	1	1.60	.....	584.00
Total	2	.....	.....	684.00
Port of Machias, district of Machias:				
Collector	1	.....	1,800.00	1,800.00
Deputy collector, inspector, and clerk	1	2.50	.....	912.50

*Not to include Sundays. †Per month. Reimbursable to Government.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
MAINE—continued.				
Port of Machias, district of Machias—Continued.				
Deputy collector and inspector	1		$450.00	$450.00
Do	1		300.00	300.00
Total	4			3,462.50
Port of Saco, district of Saco:				
Collector	1		300.00	300.00
Port of Portland, district of Portland and Falmouth:				
Collector	1		4,500.00	4,500.00
Deputy collector	1		2,000.00	2,000.00
Acting deputy collector, clerk, and superintendent of warehouses	1		*1,500.00	1,500.00
Clerks	3		1,200.00	3,600.00
Clerk and inspector	1		1,100.00	1,100.00
Storekeeper and inspector	3		†1 100.00	3,300.00
Inspector	9	$3.00		9,855.00
Gauger and inspector	1	3.00		1,095.00
Marker	1		730.00	730.00
Night watchman	1		730.00	730.00
Do	2	2.00		1,460.00
Messenger	1		650.00	650.00
Boatman	2	2.00		1,460.00
Total	27			31,980.00
Port of Waldoboro, district of Waldoboro:				
Collector	1		3,000.00	3,000.00
Deputy collector, inspector, weigher, gauger, measurer	2	3.00		2,190.00
Do	1	2.00		730.00
Do	3	2.00		2,190.00
Total	7			8,110.00
Port of Wiscasset, district of Wiscasset:				
Collector	1		700.00	700.00
Deputy collector, inspector, weigher, gauger, measurer and clerk	1	2.50		912.50
Deputy collector, inspector, weigher, gauger, and measurer	1	2.50		912.50
Deputy collector, inspector, weigher, gauger, measurer, and storekeeper	1	‡1.50		547.50
Total	4			3,072.50
Port of York, district of York:				
Collector	1		300.00	300.00
NEW HAMPSHIRE.				
Port of Portsmouth, district of Portsmouth:				
Collector	1		1,800.00	1,800.00
Deputy collector and inspector	1		1,200.00	1,200.00
Inspector	1	4.00		1,460.00
Inspector, measurer, gauger, and weigher	1	3.00		1,095.00
Inspector	1	3.00		1,095.00
Deputy collector and inspector	1	2.50		912.50
Boatman	1		400.00	400.00
Total	7			7,962.50
VERMONT.				
Port of Burlington, district of Vermont:				
Collector	1		4,000.00	4,000.00
Deputy collector, inspector, and clerk	1		1,800.00	1,800.00
Deputy collector	1		2,200.00	2,200.00
Do	2		2,000.00	4,000.00
Do	4		1,500.00	6,000.00
Deputy collector and inspector	4		1,200.00	4,800.00
Deputy collector and assistant cashier	2		1,200.00	2,400.00

* $300 reimbursable to the Government.
† Reimbursable to the Government.
‡ $72 per annum, rate of which reimbursable to the Government when employed as storekeeper.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending . 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggreg
		Per diem.	Per annum.	
VERMONT—continued.				
Port of Burlington, district of Vermont—Continued.				
Deputy collector and inspector	14	.....	$1,095.00	$15,3
Do	2	.....	1,095.00	2,1
Do	12	$3.00	.....	13,1
Do	3	*3.00	.....	3,2
Inspector	1	.....	1,095.00	1,0
Clerk and admeasurer of vessels	1	†3.00	.....	1,0
Deputy collector and inspector	7	.....	730.00	5,1
Do	4	2.00	.....	2,9
Do	2	*2.00	.....	1,4
Do	2	1.65	.....	1,2
Tally clerks	3	‡30.00	.....	6
Total	66	.....	.....	72,6
MASSACHUSETTS.				
Port of Barnstable, district of Barnstable:				
Collector	1	.....	1,300.00	1,3
Deputy collector, inspector, weigher, gauger, and measurer	1	.....	900.00	9
Deputy collector and inspector	1	2.00	.....	7
Assistant deputy collector and inspector	1	1.35	.....	4
Deputy collector and inspector	4	1.35	.....	1,9
Storekeepers	7	.....	*50.00	3
Total	15	.....	.....	5,7
Port of Boston, district of Boston and Charlestown:				
Collector's office:				
Collector	1	.....	8,000.00	8,0
Comptroller and principal clerk	1	.....	5,000.00	5,0
Deputy collector	3	.....	3,000.00	9,0
Auditor and disbursing clerk	1	.....	3,000.00	3,0
Cashier	1	.....	3,000.00	3,0
Assistant cashier	1	.....	2,200.00	2,2
Secretary and chief clerk	1	.....	2,000.00	2,0
Chief clerk	4	.....	2,000.00	8,0
Weigher	1	.....	2,000.00	2,0
Gauger	1	.....	2,000.00	2,0
Clerk	3	.....	1,800.00	5,4
Clerk and storekeeper	1	.....	1,800.00	1,8
Do	1	.....	1,600.00	1,6
Clerk	17	.....	1,600.00	27,2
Assistant weigher	3	.....	1,600.00	4,8
Clerk	19	.....	1,400.00	26,6
Do	1	4.00	.....	1,4
Deputy collector and inspector	4	4.00	.....	5,8
Inspector	69	4.00	.....	100,7
Assistant weigher	18	4.00	.....	26,2
Storekeeper	12	.....	*1,400.00	16,8
Clerk	19	.....	1,200.00	22,8
Measurer of marble	1	3.50	.....	1,2
Weigher's clerk	3	.....	1,200.00	3,6
Clerk and inspectress	1	.....	1,000.00	1,0
Clerk	8	.....	1,000.00	8,0
Foreman of laborers	1	.....	1,000.00	1,0
Carpenter	1	3.00	.....	1,0
Watchman	1	3.00	.....	1,0
Night inspector	30	3.00	.....	32,8
Clerk	2	.....	875.00	1,7
Do	8	.....	840.00	6,7
Do	1	.....	800.00	8
Clerk and storekeeper	1	.....	800.00	8
Assistant storekeeper	10	.....	*800.00	8,0
Messenger	8	.....	840.00	6,7
Do	5	.....	800.00	4,0
Do	7	.....	720.00	5,0
Do	1	§2.00	.....	6
Messenger and janitor	1	§2.00	.....	6
Night watchman	8	2.00	.....	5,8
Boatman	4	2.25	.....	3,2
Porter	23	*2.00	.....	14,3

* Reimbursable to the Government.
† When employed, with traveling expenses.
‡ Per month. For navigation season of seven mo
§ Not to include Sundays.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
MASSACHUSETTS—continued.				
Port of Boston, district of Boston and Charlestown—Continued,				
Collector's office—Continued.				
Freight elevator man	7		$600.00	$5,698.00
Janitor	1		720.00	720.00
Total	315			409,362.50
Naval office:				
Naval officer	1		5,000.00	5,000.00
Deputy naval officer	1		2,500.00	2,500.00
Assistant deputy naval and seising officer	1		2,000.00	2,000.00
Clerk	2		1,800.00	3,000.00
Clerk and acting deputy naval officer	1		1,800.00	1,800.00
Clerk	3		1,600.00	4,800.00
Do	1		1,400.00	1,400.00
Do	2		1,200.00	2,400.00
Do	3		840.00	2,520.00
Messenger	1		840.00	840.00
Total	16			26,860.00
Surveyor's office:				
Surveyor	1		5,000.00	5,000.00
Deputy surveyor	1		2,500.00	2,500.00
Clerk and assistant to surveyor and acting deputy surveyor	1		2,000.00	2,000.00
Clerk	1		1,800.00	1,800.00
Do	1		1,500.00	1,500.00
Do	1		1,400.00	1,400.00
Do	1		1,200.00	1,200.00
Messenger	1		840.00	840.00
Do	1		720.00	720.00
Total	9			16,760.00
Appraiser's office:				
Appraiser	1		3,000.00	3,000.00
Assistant appraiser	2		2,500.00	5,000.00
Examiner of drugs	1		2,500.00	2,500.00
Examiner	4		2,000.00	8,000.00
Do	5		1,800.00	9,000.00
Do	3		1,600.00	4,800.00
Do	1		1,400.00	1,400.00
Clerk	2		1,400.00	2,800.00
Sampler	1		1,200.00	1,200.00
Private secretary	1		1,200.00	1,200.00
Sampler	3		1,000.00	3,000.00
Clerk	1		1,000.00	1,000.00
Opener and packer	3		900.00	2,700.00
Clerk	2		875.00	1,750.00
Messenger	3		840.00	2,520.00
Opener and packer	13		840.00	10,920.00
Porter	1	$2.00		626.00
Do	3	2.00		2,190.00
Sugar sampler	1		875.00	875.00
Total	51			64,481.00
Recapitulation.				
Collector's office				409,362.50
Naval office				26,860.00
Surveyor's office				16,760.00
Appraiser's office				64,481.00
Total				508,463.50
Port of Edgartown, district of Edgartown:				
Collector	1		500.00	500.00
Deputy collector, inspector, weigher, gauger, and measurer	2	2.00		1,460.00
Total	3			1,960.00

* Not to include Sundays.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1895, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
MASSACHUSETTS—continued.				
Port of Fall River, district of Fall River:				
Collector	1		$3,000.00	$3,000.00
Deputy collector, weigher, gauger, and measurer	1		1,500.00	1,500.00
Inspector, weigher, and measurer	1	$3.00		1,095.00
Boatman	1		300.00	300.00
Total	4			5,895.00
Port of Gloucester, district of Gloucester:				
Collector	1		3,000.00	3,000.00
Deputy collector and inspector	1		1,200.00	1,200.00
Clerk	1		1,000.00	1,000.00
Inspector and boarding officer	3	3.00		3,285.00
Inspector	1	3.00		1,095.00
Storekeeper	4		*1,400.00	5,600.00
Boatman	1	†40.00		480.00
Total	12			15,660
Port of Marblehead, district of Marblehead:				
Collector	1		500.00	500.00
Deputy collector, inspector, weigher, gauger, measurer, and boatman	1		1,000.00	1,000.00
Deputy collector and inspector	1	2.00		730.00
Total	3			2,230.00
Port of Nantucket, district of Nantucket:				
Collector	1		300.00	300.00
Port of New Bedford, district of New Bedford:				
Collector	1		3,000.00	3,000.00
Deputy collector, inspector, and clerk	1		1,600.00	1,600.00
Clerk	1		1,000.00	1,000.00
Inspector, weigher, gauger, and measurer	1	3.00		1,095.00
Total	4			6,695.00
Port of Newburyport, district of Newburyport:				
Collector	1		400.00	400.00
Deputy collector and inspector	1		1,000.00	1,000.00
Total	2			1,400.00
Port of Plymouth, district of Plymouth:				
Collector	1		3,000.00	3,000.00
Deputy collector	1		1,000.00	1,000.00
Total	2			4,000.00
Port of Salem, district of Salem and Beverly:				
Collector	1		1,200.00	1,200.00
Deputy collector and inspector	1	4.00		1,460.00
Weigher and inspector	1	3.00		1,095.00
Inspector	2	3.00		2,190.00
Boatman	1		480.00	480.00
Total	6			6,425.00
Port of Springfield, district of Hartford:				
Surveyor	1		1,200.00	1,200.00
RHODE ISLAND.				
Port of Bristol, district of Bristol and Warren:				
Collector	1		100.00	100.00
Deputy collector and inspector	1		150.00	150.00
Total	2			250.00
Port of Newport, district of Newport:				
Collector	1		500.00	500.00
Deputy collector and clerk	1		1,000.00	1,000.00
Deputy collector and inspector	1	1.00		365.00
Inspector	1	1.00		365.00
Total	4			2,230.00

**Reimbursable to the Government.* † Per month.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
RHODE ISLAND—continued.				
Port of Providence, district of Providence:				
Collector	1		$3,000.00	$3,000.00
Deputy collector and cashier	1		2,000.00	2,000.00
Deputy collector, inspector, and clerk	1		2,000.00	2,000.00
Clerk	1		1,200.00	1,200.00
Inspector, weigher, gauger, and measurer	4	$3.00		4,380.00
Messenger and storekeeper	1	3.00		1,095.00
Storekeeper	1		*730.00	730.00
Boatman	1		600.00	600.00
Total	11			15,005.00
CONNECTICUT.				
Port of Bridgeport, district of Fairfield:				
Collector	1		2,000.00	2,000.00
Deputy collector, weigher, gauger, and measurer	1		1,600.00	1,600.00
Inspector and clerk	1		1,095.00	1,095.00
Do	1		1,200.00	1,200.00
Total	4			5,895.00
Port of Hartford, district of Hartford:				
Collector	1		3,000.00	3,000.00
Deputy collector and acting appraiser	1		1,800.00	1,800.00
Clerk	1		1,200.00	1,200.00
Deputy collector, inspector, and clerk	1		1,100.00	1,100.00
Inspector, weigher, and clerk	1		900.00	900.00
Storekeeper	2		*200.00	400.00
Total	7			8,400.00
Port of New Haven, district of New Haven:				
Collector	1		3,000.00	3,000.00
Deputy collector, inspector, and clerk	1		1,600.00	1,600.00
Do	1		1,200.00	1,200.00
Inspector and clerk	1	3.00		1,095.00
Inspector, weigher, gauger, and measurer	1	3.00		1,095.00
Inspector	1	3.00		1,095.00
Total	6			9,085.00
Port of New London, district of New London:				
Collector	1		1,200.00	1,200.00
Deputy collector and inspector	1		1,400.00	1,400.00
Inspector, weigher, gauger, and measurer	1	3.00		1,095.00
Inspector	1	3.00		1,095.00
Night inspector	1	*3.00		1,095.00
Total	5			5,885.00
Port of Stonington, district of Stonington:				
Collector	1		400.00	400.00
Deputy collector	1		500.00	500.00
Total	2			900.00
NEW YORK.				
Port of Albany:				
Surveyor	1		5,000.00	5,000.00
Deputy surveyor and inspector	1	4.00		1,460.00
Do	1	3.00		1,095.00
Inspector	4	3.00		4,380.00
Total	7			11,935.00
Port of Buffalo, district of Buffalo Creek:				
Collector	1		4,500.00	4,500.00
Appraiser	1		3,000.00	3,000.00
Deputy collector and clerk	1		2,500.00	2,500.00
Do	1		1,500.00	1,500.00
Cashier	1		1,600.00	1,600.00
Bookkeeper	1		1,400.00	1,400.00
Deputy collector and clerk	1		1,200.00	1,200.00

*Reimbursable to the Government.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
NEW YORK—continued.				
Port of Buffalo, district of Buffalo Creek—Continued.				
Clearance clerk	1		$1,200.00	$1,200.00
Impost and statistical clerk	1		1,200.00	1,200.00
Messenger	1		800.00	800.00
Inspector	1	$4.00		1,460.00
Storekeeper	1		†1,132.50	1,132.50
Deputy collector and inspector	2	4.00		2,920.00
Do	1	*4.50		1,642.50
Inspector	1	3.50		1,277.50
Inspector, clerk, and measurer of boats	1		*1,565.00	1,565.00
Inspector of live stock	1	3.50		1,277.50
Inspector of lumber	1	3.50		1,277.50
Inspector	14	3.00		15,330.00
Do	1	†3.00		1,095.00
Deputy collector, inspector, and storekeeper	1	‡3.00		1,095.00
Do	2	3.00		2,190.00
Inspector of lumber	1	§3.00		639.00
Night inspector	1	2.50		912.50
Storekeeper	1		†1,100.00	1,100.00
Deputy collector, inspector, and clearance clerk	1	‖4.00		852.00
Laborer	1		720.00	720.00
Total	42			55,386.00
Port of Cape Vincent, district of Cape Vincent:				
Collector	1		2,500.00	2,500.00
Deputy collector	1		1,500.00	1,500.00
Deputy collector and inspector	1		1,200.00	1,200.00
Do	2	3.00		2,190.00
Inspector	2	3.00		2,190.00
Deputy collector and inspector	10	¶3.00		2,760.00
Do	1	2.00		730.00
Do	2	1.25		912.50
Total	20			13,982.50
Port of Dunkirk, district of Dunkirk:				
Collector	1		1,200.00	1,200.00
Inspector	1	§3.00		639.00
Total	2			1,839.00
Port of Greenport, district of Sag Harbor:				
Surveyor	1		300.00	300.00
Port of New York, district of New York:				
Collector's office:				
Collector	1		12,000.00	12,000.00
Chief clerk of customs	1		5,000.00	5,000.00
Cashier	1		5,000.00	5,000.00
Auditor	1		4,000.00	4,000.00
Acting disbursing agent	1		4,000.00	4,000.00
Deputy collector	9		3,000.00	27,000.00
Chief clerk	2		3,000.00	6,000.00
Do	1		2,700.00	2,700.00
Do	1		2,600.00	2,600.00
Do	4		2,500.00	10,000.00
Chief clerk and superintendent warehouse	1		2,500.00	2,500.00
Assistant chief clerk	1		2,500.00	2,500.00
Private secretary	1		2,500.00	2,500.00
Paymaster	1		2,500.00	2,500.00
Stenographer and appointment clerk	1		2,200.00	2,200.00
Assistant cashier to collector	1		2,000.00	2,000.00
Chief bookkeeper	1		2,000.00	2,000.00
Paymaster of drawbacks	1		2,000.00	2,000.00
Chief teller	1		2,200.00	2,200.00
Teller	7		2,000.00	14,000.00
Confidential clerk	6		2,000.00	12,000.00
Clerk	2		2,500.00	5,000.00
Do	1		2,400.00	2,400.00
Do	15		2,200.00	33,000.00
Do	15		2,000.00	30,000.00

* $1 per diem, reimbursable to the Government.
† Reimbursable to the Government.
‡ $2 per diem reimbursable to the Government when employed in warehouse by proprietors.
§ For navigation season, seven months.
‖ For navigation, season seven months; $1 per diem reimbursable to the Government.
¶ *For summer* season, three months.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1895, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
NEW YORK—continued.				
Port of New York, district of New York—Continued.				
Collector's office—Continued.				
Clerk	12		$1,800.00	$21,600.00
Superintendent of laborers	1		1,600.00	1,600.00
Clerk and cigar inspector	1		1,600.00	1,600.00
Assistant bookkeeper	1		1,500.00	1,500.00
Clerk	42		1,600.00	67,200.00
Confidential clerk and stenographer	1		1,500.00	1,500.00
Stenographer	1		1,500.00	1,500.00
Carpenter	1		1,500.00	1,500.00
Detective	1		1,400.00	1,400.00
Do	1	$4.00		1,460.00
Custodian internal-revenue stamps	1		1,400.00	1,400.00
Clerk	59		1,400.00	82,600.00
Acting deputy collector	1	4.00		1,460.00
Inspector	308	4.00		449,680.00
Storekeeper	1		*1,400.00	1,400.00
Do	58		1,400.00	81,200.00
Engineer	1		1,200.00	1,200.00
Superintendent of supplies	1		1,200.00	1,200.00
Bookbinder	1		1,200.00	1,200.00
Clerk	82		1,200.00	98,400.00
Carpenter	1		1,100.00	1,100.00
Opener and packer	1		1,095.00	1,095.00
Engineer	1		1,000.00	1,000.00
Storekeeper at Castle Garden	1		1,000.00	1,000.00
Copyist	4		1,000.00	4,000.00
Clerk	87		1,000.00	87,000.00
Carpenter	9		900.00	900.00
Night inspector	117	3.00		128,115.00
Inspectress	9	3.00		9,855.00
Watchman (with $2.50 additional Sunday)	1		840.00	970.00
Watchman	28		840.00	23,520.00
Usher	1		840.00	840.00
Guide	2		840.00	1,680.00
Messenger	2		890.00	1,780.00
Do	61		840.00	51,240.00
Do	3		720.00	2,160.00
Floor bookkeeper	7		840.00	5,880.00
Foreman	8		840.00	6,720.00
Elevator man	7		840.00	5,880.00
Searcher	2		840.00	1,680.00
Laborer	7		720.00	5,040.00
Assistant engineer	1		840.00	840.00
Fireman	3		840.00	2,520.00
Deputy collector at Cold Springs	1		200.00	200.00
Porter	1		720.00	720.00
Bookbinder's assistant	1		600.00	600.00
Scrubwoman	1		540.00	540.00
Coastwise inspector	4	†3.00		732.00
Inspector	2	.05		36.50
Weigher	7		2,000.00	14,000.00
Gauger	1		2,000.00	2,000.00
Assistant gauger	8	4.00		11,680.00
Assistant weigher	61	‡4.00		76,372.00
Gauger's laborer	28	2.50		25,550.00
Weigher's janitor	7	‡2.00		4,382.00
Total	1,129			1,497,427.50
Naval office:				
Naval officer	1		8,000.00	8,000.00
Comptroller and acting deputy naval officer	1		3,000.00	3,000.00
Clerk	1		2,800.00	2,800.00
Auditor and clerk	1		2,500.00	2,500.00
Clerk	3		2,500.00	7,500.00
Deputy naval officer	1		2,500.00	2,500.00
Clerk	10		2,200.00	22,000.00
Do	12		2,000.00	24,000.00
Private secretary	1		2,000.00	2,000.00
Clerk	9		1,800.00	16,200.00
Do	13		1,600.00	20,800.00
Do	12		1,400.00	16,800.00
Do	13		1,200.00	15,600.00
Do	14		1,000.00	14,000.00

*Reimbursable to the Government.
†$3 per diem, but not *to exceed $732 for four* ——
‡*Not to include Sundays.*

Estimate of expense for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
NEW YORK—continued.				
Port of New York, district of New York—Continued.				
Naval office—Continued.				
Messenger	12		$840.00	$10,080.00
Do	1		660.00	660.00
Total	105			168,440.00
Surveyor's office:				
Surveyor	1		8,000.00	8,000.00
Clerk and auditor	1		5,000.00	5,000.00
Deputy surveyor	3		2,500.00	7,500.00
Private secretary	1		2,000.00	2,000.00
Clerk	2		1,800.00	3,600.00
Do	8		1,600.00	12,800.00
Inspector and measurer of vessels	6	$4.00		8,760.00
Clerk	2		1,400.00	2,800.00
Stenographer and typewriter	1	*5.00		1,565.00
Clerk	2		1,200.00	2,400.00
Messenger	9		840.00	7,560.00
Do	5		720.00	3,600.00
Foreman of laborers	1		840.00	840.00
Total	42			66,425.00
Appraiser's office:				
Appraiser	1		6,000.00	6,000.00
Assistant appraiser	9		3,000.00	27,000.00
Chief clerk	1		2,500.00	2,500.00
Stenographer	1		2,200.00	2,200.00
Examiner of tea	1		2,500.00	2,500.00
Examiner	18		2,500.00	45,000.00
Do	1		2,300.00	2,300.00
Do	8		2,200.00	17,600.00
Do	22		2,000.00	44,000.00
Law clerk	1		2,000.00	2,000.00
Expert examiner of dried fruit	1		1,800.00	1,800.00
Expert examiner of marble	1		1,800.00	1,800.00
Examiner	24		1,800.00	43,200.00
Clerk	1		1,800.00	1,800.00
Do	7		1,600.00	11,200.00
Clerk and verifier	1		1,500.00	1,500.00
Do	6		1,400.00	8,400.00
Examiner	1		1,400.00	1,400.00
Clerk and verifier	13		1,200.00	15,600.00
Clerk	6		1,200.00	7,200.00
Sampler	28		1,200.00	33,600.00
Clerk and verifier	1		1,150.00	1,150.00
Sampler	2		1,150.00	2,300.00
Foreman of openers and packers	8		1,000.00	8,000.00
Clerk	3		1,000.00	3,000.00
Opener and packer	50		900.00	45,000.00
Do	1	3.00		1,095.00
Do	1	*3.00		939.00
Clerk	4		864.00	3,456.00
Messenger	37		840.00	31,080.00
Opener and packer	80		840.00	67,200.00
Stencilers	2	*2.75		1,721.50
Opener and packer	1	*2.75		860.75
Appraiser's laborer	22		840.00	18,480.00
Total	364			462,882.25
Recapitulation.				
Collector's office				1,497,427.50
Naval office				168,440.00
Surveyor's office				66,425.00
Appraiser's office				462,882.25
Total				2,195,174.75
General appraiser's office:				
General appraiser	9		7,000.00	63,000.00
Chief clerk	1		2,750.00	2,750.00
Sample clerk	1		2,000.00	2,000.00
Clerk	2		1,600.00	3,200.00
Do	4		1,400.00	5,600.00

*Not to include Sundays.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
NEW YORK—continued.				
General appraiser's office—Continued.				
Stenographer and clerk	1		$1,400.00	$1,400.00
Clerk	3		1,200.00	3,600.00
Stenographer and typewriter	2		1,200.00	2,400.00
Clerk	1		1,000.00	1,000.00
Messengers	3		840.00	2,520.00
Janitor	1		840.00	840.00
Elevator-man	1		840.00	840.00
Messenger	1		720.00	720.00
Watchman and laborer	1		660.00	660.00
Charwoman	1		360.00	360.00
Total	32			20,880.00
Port of Ogdensburg, district of Oswegatchie:				
Collector	1		2,500.00	2,500.00
Deputy collector and inspector	1		1,600.00	1,600.00
Deputy collector, inspector, and clerk	1		1,400.00	1,400.00
Deputy collector and inspector	2		1,200.00	2,400.00
Do	1		1,000.00	1,000.00
Do	1		800.00	800.00
Do	2		600.00	1,200.00
Do	1	*$4.00		1,460.00
Do	6	3.00		6,570.00
Inspector	1	*4.00		1,460.00
Do	1	3.00		1,095.00
Deputy collector and inspector	1	2.50		912.50
Do	1	1.65		602.25
Total	20			22,999.75
Port of Oswego, district of Oswego:				
Collector	1		2,500.00	2,500.00
Deputy collector	1		1,800.00	1,800.00
Deputy collector and cashier	1		1,500.00	1,500.00
Deputy collector and clerk	1		1,200.00	1,200.00
Deputy collector	1		1,200.00	1,200.00
Deputy collector and clerk	1		1,000.00	1,000.00
Chief inspector	1	3.25		1,186.25
Deputy collector and inspector	5	†3.00		3,195.00
Deputy collector	1		900.00	900.00
Inspector	5	†3.00		3,195.00
General storekeeper	1		*1,100.00	1,100.00
Storekeeper	3	*2.50		2,737.50
Storekeeper	2	‡2.50		1,065.00
Total	24			22,578.75
Port of Patchogue:				
Surveyor	1		300.00	300.00
Port of Port Jefferson:				
Surveyor	1		300.00	300.00
Port of Plattsburg, district of Champlain:				
Collector	1		2,500.00	2,500.00
Deputy collector and inspector	1		2,000.00	2,000.00
Deputy collector and clerk	1		1,800.00	1,800.00
Deputy collector and inspector	1		1,700.00	1,700.00
Do	2		1,200.00	2,400.00
Do	2		900.00	1,800.00
Do	6		800.00	4,800.00
Do	1		600.00	600.00
Do	2	*3.00		2,190.00
Do	9	3.00		9,855.00
Inspector	1	3.00		1,095.00
Total	27			30,740.00
Port of Rochester, district of Genesee:				
Collector	1		3,200	3,200.00
Deputy collector and clerk	1		1,800	1,800.00
Do	1		1,400	1,400.00
Do	1		1,300	1,300.00
Deputy collector and inspector	1		1,200	1,200.00
Do	1	4.00		1,460.00

* Reimbursable to the Government.
† For navigation season, 7 months.
‡ For navigation season, 7 months; reimbursable to the Government.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
NEW YORK—continued.				
Port of Rochester, district of Genesee—Continued.				
Deputy collector and clerk	1	$3.85		$1,405.25
Do	1	3.00		1,095.00
Deputy collector and inspector	1	*3.00		639.00
Inspector	1	3.00		1,095.00
Storekeeper	1		†$300	300.00
Storekeeper, opener, and packer	1		650	650.00
Deputy collector and inspector	4	*3.00		2,556.00
Inspector	1	*3.00		639.00
Scrubber and cleaner	1		120	120.00
Total	18			18,859.25
Port of Sag Harbor, district of Sag Harbor:				
Collector	1			500.00
Port of Suspension Bridge, district of Niagara:				
Collector	1		4,000	4,000.00
Deputy collector and clerk	1		2,500	2,500.00
Do	1		1,500	1,500.00
Do	1		1,400	1,400.00
Do	1		1,200	1,200.00
Deputy collector and cashier	1		1,400	1,400.00
Deputy collector and inspector	1		1,450	1,450.00
Messenger	1		600	600.00
Deputy collector and inspector	1	4.00		1,460.00
Do	24	3.00		26,280.00
Do	5	*3.00		3,195.00
Deputy collector	1	†3.00		1,095.00
Deputy collector, inspector, and storekeeper	1	‡3.00		1,095.00
Storekeeper	1		†1,400	1,400.00
Inspector	3	§4.00		2,556.00
Inspectress	1	2.00		730.00
Total	45			51,861.00
NEW JERSEY.				
Port of Bridgeton, district of Bridgeton:				
Collector	1		800.00	800.00
Deputy collector and inspector	2		120.00	240.00
Total	3			1,040.00
Port of Burlington, district of Burlington:				
Collector	1		100.00	100.00
Port of Newark, district of Newark:				
Collector	1		1,200.00	1,200.00
Deputy collector and inspector	1		1,200.00	1,200.00
Storekeeper	1	†3.00		1,095.00
Total	3			3,495.00
Port of Perth Amboy, district of Perth Amboy:				
Collector	1		3,000.00	3,000.00
Deputy collector	1		1,200.00	1,200.00
Inspector and clerk	1		840.00	840.00
Deputy collector and inspector	1	3.00		1,095.00
Inspector	3	3.00		3,285.00
Storekeeper	1		†600.00	600.00
Boatman and janitor	1	1.50		547.50
Total	9			10,567.50
Port of Somers Point, district of Great Egg Harbor:				
Collector	1		300.00	300.00
Deputy collector	1		500.00	500.00
Total	2			800.00
Port of Tuckerton, district of Little Egg Harbor:				
Collector	1		300.00	300.00

* Navigation season, seven months.
† Reimbursable to the Government.
‡ $2 reimbursable from November 1 to February 28, and $1 from March 1 to October 31.
§ Navigation season, 7 months, reimbursable to the Government.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
PENNSYLVANIA.				
Port of Erie, district of Erie:				
Collector	1		$1,200.00	$1,200.00
Deputy collector and inspector	1		1,400.00	1,400.00
Inspector	1	*$3.00		639.00
Total	3			3,239.00
Port of Philadelphia, district of Philadelphia:				
Collector's office.				
Collector	1		8,000.00	8,000.00
Deputy collector	1		3,000.00	3,000.00
Assistant collector (Camden, N. J.)	1		1,500.00	1,500.00
Deputy collector and cashier	1		3,000.00	3,000.00
Auditor	1		4,500.00	4,500.00
Assistant auditor	1		2,500.00	2,500.00
Assistant cashier and clerk	1		2,500.00	2,500.00
Assistant cashier	1		2,000.00	2,000.00
Chief of division	4		2,000.00	8,000.00
Chief of warehouses and warehouse accounts	1		2,000.00	2,000.00
Secretary and confidential clerk	1		2,000.00	2,000.00
Clerks	4		1,800.00	7,200.00
Do	6		1,600.00	9,600.00
Do	11		1,400.00	15,400.00
Inspector	2	4.00		2,920.00
Deputy collector (Chester, Pa.)	1		1,400.00	1,400.00
Clerk	11		1,200.00	13,200.00
Assistant gauger	1		1,200.00	1,200.00
Storekeeper	4		†1,200.00	1,200.00
Captain of surveyor's watchmen	1	3.50		1,277.50
Inspector	67	3.50		85,592.50
Assistant weighers	16		1,100.00	17,600.00
Do	8	‡6.00		8,800.00
Foremen	2		875.00	1,750.00
Searcher	1		840.00	840.00
Stenciler	1		840.00	840.00
Foreman of weigher's laborers	1		840.00	840.00
Night watchman	1		840.00	840.00
Watchman	3		840.00	2,520.00
Do	2		720.00	1,440.00
Do	4		600.00	2,400.00
Surveyor's watchman	42		840.00	35,280.00
Messenger	5		840.00	4,200.00
Do	2		720.00	1,440.00
Do	7		600.00	4,200.00
Carpenter	1		875.00	875.00
Typewriter	1		840.00	840.00
Marker	1		720.00	720.00
Measurer's laborer	1		840.00	840.00
Gauger's laborer	1		840.00	840.00
Laborer	1		840.00	840.00
Do	17		700.00	11,900.00
Do	4		600.00	2,400.00
Skilled laborer	10		720.00	7,200.00
Watchman and storekeeper	1		600.00	600.00
Clerk	1		§50.00	600.00
Total	256			292,235.00
Naval office:				
Naval officer	1		5,000.00	5,000.00
Deputy naval officer	1		2,500.00	2,500.00
Chief clerk	1		2,000.00	2,000.00
Clerk and deputy naval officer	1		1,600.00	1,600.00
Clerk	2		1,400.00	2,800.00
Do	2		1,200.00	2,400.00
Confidential clerk and secretary	1		1,200.00	1,200.00
Clerk	3		900.00	2,700.00
Messenger	1		840.00	840.00
Total	13			21,040.00

* Navigation season, seven months.
† Reimbursable to the Government.
‡ $6 per diem when employed, not to exceed $1,100 per annum.
§ Per month and reimbursable to the Government.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
PENNSYLVANIA—continued.				
Port of Philadelphia, district of Philadelphia—Cont'd.				
Surveyor's office:				
Surveyor	1		$5,000.00	$5,000.00
Deputy surveyor	2		2,500.00	5,000.00
Chief clerk	1		2,000.00	2,000.00
Clerk	1		1,400.00	1,400.00
Do	1		1,200.00	1,200.00
Messenger	1		840.00	840.00
Do	1		720.00	720.00
Total	8			16,160.00
Appraiser's office:				
Appraiser	1		3,000.00	3,000.00
Assistant appraiser	2		2,500.00	5,000.00
Chief clerk	1		2,000.00	2,000.00
Examiner	1		2,000.00	2,000.00
Do	1		1,650.00	1,650.00
Do	6		1,600.00	9,600.00
Do	2		1,500.00	3,000.00
Do	2		1,400.00	2,800.00
Examiner of drugs	1		1,000.00	1,000.00
Clerk	2		1,200.00	2,400.00
Confidential clerk	1		1,200.00	1,200.00
Receiving clerk	1		840.00	840.00
Assistant sugar sampler	9		810.00	7,290.00
Sampler	1		840.00	840.00
Do	9		800.00	7,200.00
Foreman of laborers	1		800.00	800.00
Watchman	1		800.00	800.00
Messenger	1		740.00	740.00
Laborer	15		700.00	10,500.00
Total	58			62,660.00
Recapitulation.				
Collector's office				292,235.00
Naval office				21,040.00
Surveyor's office				16,160.00
Appraiser's office				62,660.00
Total				392,095.00
Port of Pittsburg, district of Pittsburg:				
Surveyor	1		5,000.00	5,000.00
Deputy surveyor and clerk	1		1,800.00	1,800.00
Do	1		1,200.00	1,200.00
Clerk	1		1,100.00	1,100.00
Messenger	1		600.00	600.00
Inspector and examiner	1	$4.00		1,460.00
Inspectors	3	3.00		3,285.00
Deputy surveyor	1	3.00		1,095.00
Storekeeper	1	3.00		1,095.00
Do	1	*1.50		547.50
Total	12			17,182.50
DELAWARE.				
Port of Wilmington, district of Delaware:				
Collector	1		1,700.00	1,700.00
Deputy collector, inspector, and clerk	1		1,600.00	1,600.00
Deputy collector	1		500.00	500.00
Boatman	5		300.00	1,500.00
Deputy collector and inspector	1	2.75		1,003.75
Deputy collector, inspector, weigher, gauger, and measurer	1	2.75		1,003.75
Deputy collector and inspector	1	1.65		602.25
Total	11			7,909.75
MARYLAND.				
Port of Annapolis, district of Annapolis:				
Collector	1		500.00	500.00
Deputy collector, inspector, and clerk	1		†50.00	600.00
Total	2			1,100.00

*Reimbursable to the Government.

†Per month.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
MARYLAND—continued.				
Port of Baltimore, district of Baltimore:				
Collector's office—				
Collector	1		$7,000.00	$7,000.00
Appraiser	1		3,000.00	3,000.00
Deputy collector	2		3,000.00	6,000.00
Cashier	1		2,500.00	2,500.00
Assistant cashier	1		1,800.00	1,800.00
Auditor	1		2,500.00	2,500.00
Assistant auditor	1		1,800.00	1,800.00
Clerk	6		1,800.00	10,800.00
Do	6		1,600.00	9,600.00
Do	8		1,400.00	11,200.00
Do	7		1,200.00	8,400.00
Do	2		800.00	1,600.00
Clerk and storekeeper	1		1,800.00	1,800.00
Examiner	2		1,800.00	3,600.00
Do	2		1,400.00	2,800.00
Do	1		1,600.00	1,600.00
Bond and record clerk	1		1,600.00	1,600.00
Inspector	35	$3.50		44,712.50
Captain of night inspectors	1	3.50		1,277.50
Night inspector	23	3.00		25,185.00
Engineer	1		1,200.00	1,200.00
Assistant weigher and acting gauger	1		1,300.00	1,300.00
Assistant weigher	11		1,200.00	13,200.00
Storekeeper	6		*1,200.00	7,200.00
Do	1		1,200.00	1,200.00
Private secretary	1		900.00	900.00
Messenger	1		900.00	900.00
Captain of night watch	1		875.00	875.00
Keeper of scales room	1		660.00	660.00
Fireman	1		1,095.00	1,095.00
Female examiner	1		600.00	600.00
Watchman	4		840.00	3,360.00
Foreman of porters	1		820.00	820.00
Porter	3		820.00	2,460.00
Boatman on steam launch	1	†60.00		720.00
Do	2	†45.00		1,080 00
Do	1	†40.00		480 00
Messengers	9		720.00	6,480.00
Sampler	1		875.00	875.00
Laborer	6		840.00	5,040.00
Do	4		720.00	2,880.00
Do	4	†60.00		2,880.00
Do	8	1.75		5,110.00
Foreman of laborers	1		840.00	840.00
Messenger	1		840.00	840.00
Assistant weigher for night duty	1	‡6.00		840.00
Storekeeper	4		*840.00	3,360.00
Total	180			215,970.00
Naval office:				
Naval officer	1		5,000.00	5,000.00
Deputy naval officer	1		2,500.00	2,500.00
Clerk	2		1,600.00	3,200.00
Do	3		1,400.00	4,200.00
Do	1		1,200.00	1,200.00
Messenger	1		840.00	840.00
Total	9			16,940.00
Surveyor's office:				
Surveyor	1		4,500.00	4,500.00
Deputy surveyor	1		2,500.00	2,500.00
Private secretary	1		1,600.00	1,600.00
Clerk	1		1,200.00	1,200.00
Messenger	2		840.00	1,680.00
Do	1		720.00	720.00
Total	7			12,200.00

*Reimbursable to the Government. †Per month.
‡$6 per diem when employed, not to exceed $840 per annum.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
MARYLAND—continued.				
Recapitulation.				
Collector's office	.....	.....	.....	$215,970.00
Naval office	.....	.....	.....	16,940.00
Surveyor's office	.....	.....	.....	12,200.00
Total	.....	.....	.....	245,110.00
Port of Crisfield, eastern district.				
Collector	1	.....	$2,500.00	2,500.00
Deputy collector, inspector, and clerk	1	*$75.00	.....	900.00
Total	2	.....	.....	3,400.00
DISTRICT OF COLUMBIA.				
Port of Georgetown, District of Georgetown:				
Collector	1	.....	3,000.00	3,000.00
Deputy collector and inspector	1	.....	1,800.00	1,800.00
Do	1	4.00	.....	1,466.00
Do	1	3.50	.....	1,277.50
Inspector and clerk	1	3.00	.....	1,095.00
Janitor	1	*60.00	.....	720.00
Total	6	.....	.....	9,352.50
VIRGINIA.				
Port of Alexandria, district of Alexandria:				
Collector	1	.....	300.00	300.00
Deputy collector and inspector	1	.....	1,200.00	1,200.00
Total	2	.....	.....	1,500.00
Port of Cape Charles City, district of Cherrystone:				
Collector	1	.....	300.00	300.00
Deputy collector	1	.....	900.00	900.00
Deputy collector, inspector,, and boatman	1	.....	480.00	480.00
Total	3	.....	.....	1,680.00
Port of Norfolk, district of Norfolk and Portsmouth:				
Collector	1	.....	3,000.00	3,000.00
Deputy collector	1	.....	1,600.00	1,600.00
Entry clerk and cashier	1	.....	1,300.00	1,300.00
Marine clerk	1	.....	1,300.00	1,300.00
Watchman	1	.....	720.00	720.00
Inspector	1	4.00	.....	1,460.00
Do	2	3.00	.....	2,190.00
Boatman	1	*40.00	.....	480.00
Do	1	*30.00	.....	360.00
Total	10	.....	.....	12,410.00
Port of Newport News, district of Newport News:				
Collector	1	.....	3,000.00	3,000.00
Deputy collector and inspector	1	.....	1,460.00	1,460.00
Deputy collector	1	.....	600.00	600.00
Inspector and clerk	1	3.00	.....	1,095.00
Inspector, weigher, and gauger	1	3.00	.....	1,095.00
Inspector	2	3.00	.....	2,190.00
Boatman and janitor	1	.....	420.00	420.00
Do	1	*35.00	.....	420.00
Boatman	2	*35.00	.....	840.00
Total	11	.....	.....	11,120.00
Port of Petersburg, district of Petersburg:				
Collector	1	.....	100.00	100.00
Port of Richmond, district of Richmond:				
Collector	1	.....	$1,000.00	1,000.00
Deputy collector, inspector, and clerk	1	.....	1,200.00	1,200.00
Inspector and clerk	1	3.00	.....	1,095.00
Inspector, weigher, gauger, and measurer	1	3.00	.....	1,095.00
Inspector	1	3.00	.....	1,095.00
Deputy collector and inspector	1	2.00	.....	730.00
Boatman	1	*35.00	.....	420.00
Total	7	.....	.....	6,635.00

*Per month.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
VIRGINIA—continued.				
Port of Tappahannock, district of Tappahannock:				
Collector	1		$500.00	$500.00
Deputy collector	1		200.00	200.00
Total	2			700.00
WEST VIRGINIA.				
Port of Wheeling, district of New Orleans:				
Surveyor	1		600.00	600.00
Deputy surveyor	1		800.00	800.00
Total	2			1,400.00
NORTH CAROLINA.				
Port of Beaufort, district of Beaufort:				
Collector	1		1,200.00	1,200.00
Port of Edenton, district of Albemarle:				
Collector	1		1,200.00	1,200.00
Deputy collector and inspector	1		720.00	720.00
Total	2			1,920.00
Port of New Berne, district of Pamlico:				
Collector	1		1,500.00	1,500.00
Deputy collector and inspector	1		900.00	900.00
Do	1		600.00	600.00
Messenger	1		240.00	240.00
Deputy collector and inspector	1	$1.00		365.00
Total	5			3,605.00
Port of Wilmington, district of Wilmington:				
Collector	1		3,000.00	3,000.00
Deputy collector	1		1,800.00	1,800.00
Deputy collector and chief inspector	1		1,600.00	1,600.00
Clerk	1		1,000.00	1,000.00
Inspector	2	3.00		2,190.00
Boatman	4		420.00	1,680.00
Total	10			11,270.00
SOUTH CAROLINA.				
Port of Beaufort, district of Beaufort:				
Collector	1		1,800.00	1,800.00
Deputy collector and inspector	1	3.00		1,095.00
Do	1	2.50		912.50
Boatman	1	*30.00		360.00
Do	3	*25.00		900.00
Total	7			5,067.50
Port of Charleston, district of Charleston:				
Collector	1		2,000.00	2,000.00
Deputy collector and clerk	1		2,000.00	2,000.00
Deputy collector	2		1,500.00	3,000.00
Chief inspector	1	4.00		1,460.00
Inspector	3	3.00		3,285.00
Clerk	1		1,500.00	1,500.00
Messenger	1		730.00	730.00
Boatman	2	*40.00		960.00
Total	12			14,935.00
Port of Georgetown, district of Georgetown:				
Collector	1		400.00	400.00
Deputy collector	1		600.00	600.00
Total	2			1,000.00

*Per month

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
GEORGIA.				
Port of Atlanta, district of Atlanta:				
Surveyor	1		$1,200.00	$1,200.00
Deputy surveyor	1		600.00	600.00
Total	2			1,800.00
Port of Brunswick, district of Brunswick:				
Collector	1		3,000.00	3,000.00
Deputy collector	1		1,600.00	1,600.00
Deputy collector and inspector	1	$3.00		1,095.00
Inspector	1	3.00		1,095.00
Boatman	1		300.00	300.00
Total	5			7,090.00
Port of St. Marys, district of St. Marys:				
Collector	1		700.00	700.00
Deputy collector and inspector	1		700.00	700.00
Total	2			1,400.00
Port of Savannah, district of Savannah:				
Collector	1		6,000.00	6,000.00
Deputy collector	1		2,000.00	2,000.00
Deputy collector and clerk	1		1,500.00	1,500.00
Clerk	2		1,500.00	3,000.00
Messenger	1		720.00	720.00
Deputy collector and inspector	1	4.00		1,460.00
Inspector	2	3.00		2,190.00
Boatman on steam launch	3	*50.00		1,800.00
Boatman	1	*30.00		360.00
Storekeeper	2		1,100.00	2,200.00
Total	15			21,230.00
FLORIDA.				
Port of Apalachicola, district of Apalachicola:				
Collector	1		1,200.00	1,200.00
Deputy collector	1	3.00		1,095.00
Inspector	1	2.00		730.00
Messenger	1		150.00	150.00
Total	4			3,175.00
Port of Cedar Keys, district of St. Marks:				
Collector	1		600.00	600.00
Deputy collector and inspector	2	3.00		2,190.00
Inspector	1	1.35		492.75
Total	4			3,282.75
Port of Fernandina, district of Fernandina:				
Collector	1		800.00	1,800.00
Deputy collector, inspector, weigher, and gauger	1	3.00		1,095.00
Boatman	1	*25.00		300.00
Total	3			3,195.00
Port of Jacksonville, district of St. Johns:				
Collector	1		2,500.00	2,500.00
Deputy collector and inspector	1	4.00		1,460.00
Inspector, weigher, and gauger	1	75.00		900.00
Messenger	1	25.00		300.00
Total	4			5,160.00
Port of Key West, district of Key West				
Collector	1		4,500.00	4,500.00
Deputy collector and clerk	1		2,500.00	2,500.00
Do	1		1,800.00	1,800.00
Inspector	2	†6.00		4,380.00
Leaf-tobacco examiner and clerk	1		1,500.00	1,500.00
Clerk	2		1,400.00	2,800.00
Do	3		1,200.00	3,600.00

* Per month. † Reimbursable to the Government.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
FLORIDA—continued.				
Port of Key West, district of Key West—Continued.				
Storekeeper	1		*$1,400.00	$1,400.00
Messenger and clerk	1		900.00	900.00
Storekeeper	1		*1,200.00	1,200.00
Watchman	1		730.00	730.00
Janitor	1		600.00	600.00
Boatman	4		400.00	1,600.00
Deputy collector and examiner	1		1,400.00	1,400.00
Chief inspector	1	$3.50		1,277.50
Inspector	6	3.00		6,570.00
Chief night inspector	1	3.00		1,095.00
Night inspector	3	2.50		2,737.50
Deputy collector and inspector	1	2.00		730.00
Do	1	1.50		547.50
Assistant storekeeper	1		*600.00	600.00
Boatman	1		300.00	300.00
Inspectress	1	†30.00		360.00
Total	37			43,127.50
Port of Pensacola, district of Pensacola:				
Collector	1		3,000.00	3,000.00
Deputy collector	1		1,600.00	1,600.00
Deputy collector and clerk	1		1,200.00	1,200.00
Clerk	1		1,000.00	1,000.00
Messenger	1		600.00	600.00
Inspector	4	3.00		4,380.00
Night watchman	2	2.00		1,460.00
Pilot on steam launch	1		†50.00	600.00
Fireman on steam launch	1		†45.00	540.00
Boatman	2		†35.00	840.00
Total	15			15,220.00
Port of St. Augustine, district of St. Augustine:				
Collector	1		500.00	500.00
Deputy collector and inspector	1		480.00	480.00
Inspector	1	2.00		730.00
Total	3			1,710.00
Port of Tampa, district of Tampa:				
Collector	1		3,000.00	3,000.00
Deputy collector and clerk	1		1,500.00	1,500.00
Inspector and acting appraiser	1	4.00		1,460.00
Inspector and clerk	1	3.00		1,095.00
Deputy collector and clerk	1	3.00		1,095.00
Inspector	4	3.00		4,380.00
Storekeeper	1	*3.00		1,095.00
Deputy collector and inspector	1	1.50		547.50
Boatman	2		420.00	840.00
Total	13			15,012.50
ALABAMA.				
Port of Mobile, district of Mobile:				
Collector	1		3,000.00	3,000.00
Deputy collector and cashier	1		1,600.00	1,600.00
Deputy collector, inspector, and clerk	1		1,400.00	1,400.00
Messenger	1		450.00	450.00
Acting storekeeper and appraiser	1	3.50		1,277.50
Inspector	4	2.50		3,650.00
Boatman	2		480.00	960.00
Total	11			12,337.50
MISSISSIPPI.				
Port of Natchez, district of Natchez:				
Collector	1		500.00	500.00
Port of Shieldsboro, district of Pearl River:				
Collector	1		2,500.00	2,500.00
Deputy collector and inspector	2	3.00		2,190.00
Inspector	1	3.00		1,095.00
Boatman and deputy collector	1	‡3.00		1,095.00
Total	5			6,880.00

*Reimbursable to the *Government*. †*Per month*. ‡Includes expenses of boat hire.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1895, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
MISSISSIPPI—continued.				
Port of Vicksburg, district of Vicksburg:				
Collector	1		$500.00	$500.00
LOUISIANA.				
Port of Brashear, district of Teche:				
Collector	1		1,200.00	1,200.00
Deputy collector and inspector	2	$3.00		2,190 00
Total	3			3,390.00
Port of New Orleans, district of New Orleans:				
Collector's office:				
Collector	1		7,000.00	7,000.00
Appraiser	1		3,000.00	3,000.00
Assistant appraiser	2		2,500.00	5,000.00
Deputy collector	2		3,000.00	6,000.00
Cashier	1		2,500.00	2,500.00
Corresponding clerk and stenographer	1		2,500.00	2,500.00
Auditor	1		2,500.00	2,500.00
Clerk	1		1,800.00	1,800.00
Weigher	1		2,000.00	2,000.00
Examiner	2		1,800.00	3,600.00
Assistant cashier of the collector	1		1,600.00	1,600.00
Clerk	4		1,600.00	6,400.00
Examiner	1		1,600.00	1,600.00
Gauger	1		1,500.00	1,500.00
Storekeeper	2		1,460.00	2,920.00
Private secretary	1		1,400.00	1,400.00
Clerk, acting deputy collector, and immigrant inspector	1		1,460.00	1,460.00
Clerk	10		1,400.00	14,000.00
Do	7		1,200.00	8,400.00
Examiner	1		1,200.00	1,200.00
Assistant weigher	5		1,200.00	6,000.00
Examiner of drugs	1		1,000.00	1,000.00
Acting deputy collector and inspector	1		1,200.00	1,200.00
Captain night inspectors and inspector	1	3.00		1,095.00
Inspector	14	3.00		15,330.00
Captain of night watch	1		880.00	880.00
Packer	1		850.00	850.00
Opener and packer	1		850.00	850.00
Chief laborer	1		800.00	800.00
Clerk	9		800.00	7,200.00
Sampler	1		750.00	750.00
Opener and packer	3		720.00	2,160.00
Messenger	1		750.00	750.00
Do	6		600.00	3,600.00
Assistant storekeeper	6	*2.25		4,927.50
Inspector	19	2.25		15,603.75
Night inspector	16	2.25		13,140.00
Boatman	3		600.00	1,800.00
Laborer	31		600.00	18,600.00
Inspectress	1	2.00		730.00
Total	165			173,646.25
Naval office:				
Naval officer	1		5,000.00	5,000.00
Deputy naval officer	1		2,500.00	2,500.00
Clerk	1		1,800.00	1,800.00
Do	2		1,600.00	3,200.00
Do	1		1,400.00	1,400.00
Do	1		840.00	840.00
Messenger	1		600.00	600.00
Total	8			15,340.00
Surveyor's office:				
Surveyor	1		3,500.00	3,500.00
Deputy surveyor	1		2,500.00	2,500.00
Clerk	1		1,600.00	1,600.00
Do	1		1,400.00	1,400.00
Messenger	3		600.00	1,800.00
Total	7			10,800.00

* Reimbursable to the Government.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
LOUISIANA—continued.				
Recapitulation.				
Collector's office				$173,646.25
Naval office				15,340.00
Surveyor's office				10,800.00
Total				199,786.25
TEXAS.				
Port of Brownsville, district of Brazos de Santiago:				
Collector	1		$2,500.00	2,500.00
Deputy collector and cashier	1		1,600.00	1,600.00
Deputy collector, chief clerk, and bookkeeper	1		1,400.00	1,400.00
Deputy collector and inspector	1		1,400.00	1,400.00
Deputy collector and clerk	1		1,200.00	1,200.00
Messenger	1		720.00	720.00
Deputy collector and inspector	3	$3.00		3,285.00
Inspector	4	3.00		4,380.00
Mounted inspector	9	*3.50		11,497.50
Mounted inspector and boarding officer	2	*3.50		2,555.00
Mounted inspector and deputy collector	1	*3.50		1,277.50
Inspectress	1	2.00		730.00
Total	26			32,545.00
Port of Corpus Christi, district of Corpus Christi:				
Collector	1		4,000.00	4,000.00
Deputy collector and inspector	1		1,800.00	1,800.00
Deputy collector, inspector, and clerk	1		1,600.00	1,600.00
Assayer of ores	1		1,600.00	1,600.00
Deputy collector	1	$4.00		1,460.00
Clerk and inspector	1		1,200.00	1,200.00
Do	1	3.00		1,095.00
Inspector	1	†3.00		1,095.00
Do	3	3.00		3,285.00
Do	2	*3.50		2,555.00
Mounted inspector	4	*3.50		5,110.00
Night inspector	1	3.00		1,095.00
Do	1	2.00		730.00
Inspectress	1	2.00		730.00
Boatman and inspector	1	2.00		730.00
Inspector and porter	1	2.00		730.00
Porter and messenger	1		420.00	420.00
Total	23			29,235.00
Port of El Paso, district of Paso del Norte:				
Collector	1		2,000.00	2,000.00
Deputy collector	1		1,800.00	1,800.00
Assayer of ores, inspector, and clerk	1		1,600.00	1,600.00
Clerk	2		1,400.00	2,800.00
Storekeeper	1		†1,200.00	1,200.00
Deputy collector and inspector	2	3.00		2,190.00
Do	1	3.30		1,204.50
Do	1	*3.50		1,277.50
Mounted inspector	5	*3.50		6,387.50
Inspector	2	3.00		2,190.00
Night inspector	4	2.00		2,920.00
Inspectress	1		600.00	600.00
Janitor	1		‡50.00	600.00
Assistant to the assayer	1		‡50.00	600.00
Total	24			27,369.50
Port of Eagle Pass, district of Saluria:				
Collector	1		3,000.00	3,000.00
Deputy collector and inspector	1		1,600.00	1,600.00
Assayer of ores	1		1,600.00	1,600.00
Inspector and clerk	1		1,400.00	1,400.00
Deputy collector and clerk	1	2.00		730.00
Deputy collector and mounted inspector	2	*3.50		2,555.00
Mounted inspector	6	*3.50		7,665.00

* Includes 50 cents per diem for horse feed.
† Reimbursable to the Government.
‡ Per month.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
TEXAS—continued.				
Port of Eagle Pass, district of Saluria—Continued.				
Deputy collector and inspector	1	$3.50		$1,277.50
Inspector and storekeeper	1	3.50		1,277.50
Inspector	3	3.00		3,285.00
Laborer and assistant to the assayer	1	1.50		547.50
Porter and messenger	1		*$40.00	480.00
Total	20			25,417.50
Port of Galveston, district of Galveston:				
Collector	1		4,000.00	4,000.00
Deputy collector and clerk	1		2,000.00	2,000.00
Do	1		1,800.00	1,800.00
Cashier	1		1,800.00	1,800.00
Clerk	3		1,[illegible]00.00	4,800.00
Do	1		1,200.00	1,200.00
Storekeeper	1		1,400.00	1,400.00
Chief inspector	1	4.00		1,460.00
Deputy collector and inspector	1	3.50		1,277.50
Inspector	4	3.00		4,380.00
Deputy collector and mounted inspector	1	†3.50		1,277.50
Weigher, gauger, and measurer	1	3.50		1,277.50
Night inspector	4	3.00		4,380.00
Messenger	1	2.00		730.00
Boatman	2		720.00	1,440.00
Porter	1		500.00	500.00
Laborer	1		*40.00	480.00
Total	26			34,202.50
TENNESSEE.				
Port of Chattanooga, district of New Orleans:				
Surveyor	1		500.00	500.00
Port of Memphis, district of New Orleans:				
Surveyor	1		3,000.00	3,000.00
Deputy surveyor	1		1,400.00	1,400.00
Inspector, weigher, gauger, and storekeeper	1	3.50		1,277.50
Inspector	1	3.00		1,095.00
Total	4			6,772.50
Port of Nashville, district of New Orleans:				
Surveyor	1		1,000.00	1,000.00
KENTUCKY.				
Port of Louisville, district of New Orleans:				
Surveyor	1		5,000.00	5,000.00
Deputy surveyor and clerk	1		1,800.00	1,800.00
Do	1		1,500.00	1,500.00
Deputy surveyor and bookkeeper	1		1,500.00	1,500.00
Entry clerk	1		1,500.00	1,500.00
Inspector, examiner, and storekeeper	1	4.00		1,460.00
Inspector, weigher, and gauger	1	3.50		1,277.50
Storekeeper and gauger	1		‡1,440.00	1,440.00
Opener and packer	1		750.00	750.00
Messenger	1	2.00		730.00
Clerk	1		*55.00	660.00
Total	11			17,617.50
Port of Paducah, district of New Orleans:				
Surveyor	1		500.00	500.00
OHIO.				
Port of Cincinnati, district of New Orleans:				
Surveyor	1		5,000.00	5,000.00
Appraiser	1		3,000.00	3,000.00
Deputy surveyor	1		2,000.00	2,000.00
Examiner	1		1,800.00	1,800.00
Deputy surveyor and clerk	1		1,400.00	1,400.00
Gauger and entry clerk	1		1,350.00	1,350.00

* Per month.
† *Includes 50 cents per diem for horse feed.*
‡ *$360 as gauger; and $90 per month as storekeeper, reimbursable to the Government.*

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
OHIO—continued.				
Port of Cincinnati, district of New Orleans—Continued.				
Clerk	1		$1,250.00	$1,250.00
Liquidating clerk	1		1,200.00	1,200.00
Bookkeeper	1		1,200.00	1,200.00
Clerk	2		1,000.00	2,000.00
Storekeeper	1		1,100.00	1,100.00
Weigher and assistant gauger	1		900.00	900.00
Opener and packer	1		900.00	900.00
Porter	1		720.00	720.00
Laborer	1		600.00	600.00
Messenger	1		480.00	480.00
Special examiner of drugs (when employed)	1	$5.00		1,825.00
Examiner, inspector, weigher, gauger, and measurer	1	4.00		1,460.00
Inspector	3	3.50		3,832.50
Clerk and admeasurer	1	3.00		1,095.00
Total	23			33,112.50
Port of Columbus:				
Surveyor	1		3,000.00	3,000.00
Deputy surveyor and clerk	1		1,200.00	1,200.00
Inspector, examiner, and clerk	1	3.00		1,095.00
Total	3			5,295.00
Port of Cleveland, district of Cuyahoga:				
Collector	1		3,000.00	3,000.00
Appraiser	1		3,000.00	3,000.00
Deputy collector and clerk	1		1,800.00	1,800.00
Do	1		1,500.00	1,500.00
Do	1		1,400.00	1,400.00
Do	2		1,200.00	2,400.00
Do	1		1,000.00	1,000.00
Examiner	1		1,000.00	1,000.00
Storekeeper and opener and packer	1		900.00	900.00
Laborer	1		540.00	540.00
Deputy collector and inspector	1	3.50		1,277.50
Do	1	3.00		1,095.00
Inspector	2	3.00		2,190.00
Watchman	1	*2.50		1,065.00
Deputy collector and night inspector	1	2.50		912.50
Do	1	†2.50		532.50
Deputy collectors and inspectors	2	†2.00		852.00
Total	20			24,464.50
Port of Sandusky, district of Sandusky:				
Collector	1		2,500.00	2,500.00
Deputy collector and inspector	1		‡60.00	720.00
Do	2	1.10		803.00
Do	2	.55		401.50
Deputy collector and inspector ($1 per diem from Apr. 1 to Nov. 30; 55 cents per diem from Dec. 1 to Mar. 31)	1			310.55
Deputy collector and inspector	1	.30		109.50
Total	8			4,844.55
Port of Toledo, district of Miami:				
Collector	1		2,500.00	2,500.00
Deputy collector	1		1,400.00	1,400.00
Deputy collector, inspector and gauger	1		1,200.00	1,200.00
Deputy collector and inspector	1	3.00		1,095.00
Deputy collector and inspector (for night service)	1	3.00		1,095.00
Messenger	1		300.00	300.00
Total	6			7,590.00
INDIANA.				
Port of Evansville, district of New Orleans:				
Surveyor	1		750.00	750.00
Deputy surveyor and gauger	1		800.00	800.00
Total	2			1,550.00

*Includes double pay for Sundays and holidays.
†For navigation season, *seven months.*
‡*Per month.*

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
INDIANA—continued.				
Port of Indianapolis:				
Surveyor	1		$5,000.00	$5,000.00
Deputy surveyor and entry clerk	1		1,400.00	1,400.00
Deputy surveyor and inspector	1	$3.00		1,095.00
Opener and packer	1		600.00	600.00
Total	4			8,095.00
ILLINOIS.				
Port of Cairo, district of New Orleans:				
Surveyor	1		500.00	500.00
Port of Galena, district of New Orleans:				
Surveyor	1		500.00	500.00
Port of Rock Island, district of New Orleans:				
Surveyor	1		500.00	500.00
Port of Peoria, district of New Orleans:				
Surveyor	1		500.00	500.00
Port of Chicago, district of Chicago:				
Collector	1		7,000.00	7,000.00
Appraiser	1		3,000.00	3,000.00
Surveyor (Michigan City, Ind.)	1		350.00	350.00
Deputy collector and clerk	2		3,000.00	6,000.00
Do	1		2,300.00	2,300.00
Deputy collector	1		1,800.00	1,800.00
Clerk and auditor	1		2,700.00	2,700.00
Cashier	1		2,500.00	2,500.00
Confidential secretary	1		2,400.00	2,400.00
Examiner of teas	1		2,000.00	2,000.00
Chief examiner	1		1,800.00	1,800.00
Examiner	1		1,700.00	1,700.00
Do	2		1,600.00	3,200.00
Chief clerk	1		1,700.00	1,700.00
Assistant entry clerk	1		1,700.00	1,700.00
Clerk	1		1,600.00	1,600.00
Do	6		1,500.00	9,000.00
Do	3		1,400.00	4,200.00
Chief weigher	1		1,500.00	1,500.00
Chief acting disbursing officer	1		1,500.00	1,500.00
Assistant cashier	1		1,400.00	1,400.00
Examiner	1		1,400.00	1,400.00
Assistant weigher	1	4.00		1,460.00
Gauger	1	4.00		1,460.00
Inspector and clerk	1	4.00		1,460.00
Inspector of cigars	1		1,460.00	1,460.00
Clerk	2		1,300.00	2,600.00
Do	3		1,200.00	3,600.00
Assistant weigher	1	3.50		1,277.50
Assistant gauger	1	3.50		1,277.50
Inspector	8	3.50		10,220.00
Assistant examiner	1		1,200.00	1,200.00
Storekeeper	4		1,100.00	4,400.00
Clerk	1		1,100.00	1,100.00
Do	4		1,000.00	4,000.00
Inspector	18	3.00		19,710.00
Opener and packer	3	2.50		2,737.50
Deputy collector	1		900.00	900.00
Messenger	3		840.00	2,520.00
Storekeeper	1		780.00	*780.00
Do	2	*2.25		1,642.50
Opener and packer	3	2.00		2,190.00
Watchman	3	2.00		2,190.00
Laborer	9	2.00		6,570.00
Total	103			135,505.00
MISSOURI.				
Port of Kansas City, district of New Orleans:				
Surveyor	1		5,000.00	5,000.00
Deputy surveyor and inspector	1		1,500.00	1,500.00
Do	1		1,200.00	1,200.00

*Reimbursable to the Government.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
MICHIGAN—continued.				
Port of Grand Haven:				
Collector	1	.....	$2,500.00	$2,500.00
Deputy collector and inspector	1	.....	1,200.00	1,200.00
Deputy collector and clerk	1	$1.65	.....	602.25
Deputy collector and inspector	1	*2.00	.....	426.00
Do	1	*1.50	.....	319.50
Do	1	1.00	.....	365.00
Do	1	*1.00	.....	213.00
Do	4	*.65	.....	553.80
Do	3	*.50	.....	319.50
Total	14	.....	.....	6,499.05
Port of Grand Rapids:				
Surveyor	1	.....	1,800.00	1,800.00
Port of Marquette, district of Superior:				
Collector	1	.....	2,500.00	2,500.00
Deputy collector and inspector	2	.....	1,200.00	2,400.00
Inspector and deputy collector	4	3.00	.....	4,380.00
Clerk	1	2.00	.....	730.00
Inspectress	1	†2.00	.....	300.00
Deputy collector and inspector	1	.80	.....	292.00
Deputy collector	1	*3.00	.....	639.00
Deputy collector and inspector	2	*2.00	.....	852.00
Do	1	*1.00	.....	213.00
Do	1	*.80	.....	170.40
Do	2	*.75	.....	319.50
Do	2	*.50	.....	213.00
Total	19	.....	.....	13,008.90
Port of Port Huron, district of Huron:				
Collector	1	.....	3,600.00	3,600.00
Deputy collector	1	.....	2,000.00	2,000.00
Do	1	.....	1,400.00	1,400.00
Deputy collector and cashier	1	.....	1,500.00	1,500.00
Deputy collector and clerk	1	.....	1,400.00	1,400.00
Deputy collector and inspector	2	.....	1,300.00	2,600.00
Do	1	.....	1,200.00	1,200.00
Storekeeper	1	.....	‡1,100.00	1,100.00
Deputy collector and inspector	1	.....	1,100.00	1,100.00
Do	2	.....	900.00	1,800.00
Do	1	.....	1,000.00	1,000.00
Deputy collector, inspector, and clerk	1	.....	1,000.00	1,000.00
Do	1	3.00	.....	1,095.00
Deputy collector and inspector	19	.....	864.00	16,416.00
Do	5	.....	‡864.00	4,320.00
Deputy collector and messenger	1	.....	730.00	730.00
Inspector and night watchman	1	.....	730.00	730.00
Messenger	1	.....	730.00	730.00
Deputy collector and inspector	1	.....	600.00	600.00
Do	2	.....	425.00	850.00
Do	1	.....	400.00	400.00
Do	1	.....	360.00	360.00
Inspectress	1	.....	240.00	240.00
Deputy collector and inspector	1	.....	§600.00	400.00
Do	3	.....	§300.00	600.00
Total	52	.....	.....	47,171.00
WISCONSIN.				
Port of La Crosse, district of New Orleans:				
Surveyor	1	.....	1,200.00	1,200.00
Port of Milwaukee, district of Milwaukee:				
Collector	1	.....	3,500.00	3,500.00
Deputy collector and inspector	1	.....	2,000.00	2,000.00
Deputy collector and clerk	1	.....	1,800.00	1,800.00
Deputy collector and inspector	1	.....	1,350.00	1,350.00
Do	2	.....	1,200.00	2,400.00
Do	1	3.00	.....	1,095.00

* For navigation season, seven months.
† $2 per diem when employed; not to exceed $300 per annum.
‡ Reimbursable to the Government.
§ Navigation season, two-thirds allowed.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
COLORADO.				
Port of Denver:				
Surveyor	1		$3,000.00	$3,000.00
Deputy surveyor and inspector	1		1,200.00	1,200.00
Inspector, storekeeper, and gauger	1	$3.00		1,095.00
Total	3			5,295.00
CALIFORNIA.				
Port of Eureka, district of Humboldt:				
Collector	1		2,800.00	2,800.00
Port of San Diego, district of San Diego:				
Collector	1		3,000.00	3,000.00
Deputy collector	1		1,800.00	1,800.00
Deputy collector and inspector	1	4.00		1,460.00
Deputy collector and mounted inspector	1	4.00		1,460.00
Do	1	3.50		1,277.50
Inspector	2	3.00		2,190.00
Inspector and clerk	1	3.00		1,095.00
Boatman	1		730.00	730.00
Total	9			13,012.50
Port of San Francisco, district of San Francisco:				
Collector's office:				
Collector	1		7,000.00	7,000.00
Appraiser	1		3,625.00	3,625.00
Assistant appraiser	2		2,500.00	5,000.00
Auditor	1		3,800.00	3,800.00
Deputy collector	3		3,625.00	10,875.00
Clerk and cashier	1		3,200.00	3,200.00
Clerk	1		3,000.00	3,000.00
Do	1		2,200.00	2,200.00
Do	1		2,000.00	2,000.00
Do	12		1,800.00	21,600.00
Examiner of drugs	1		2,000.00	2,000.00
Gauger	1		2,000.00	2,000.00
Weigher	1		2,000.00	2,000.00
Examiner	4		2,000.00	8,000.00
Assistant cashier	1		1,800.00	1,800.00
Superintendent of warehouses	1		1,800.00	1,800.00
Clerk	11		1,600.00	17,600.00
Do	5		1,200.00	6,000.00
Examiner	2		1,600.00	3,200.00
Clerk	1		1,500.00	1,500.00
Do	5		1,400.00	7,000.00
Assistant storekeeper	8		*1,400.00	11,200.00
Inspector	32	4.00		46,720.00
Do	1	4.00		1,460.00
Sampler	3		1,200.00	3,600.00
Examiner	1		1,200.00	1,200.00
Assistant weigher	16		1,200.00	19,200.00
Foreman of laborers	2		1,100.00	2,200.00
Clerk and messenger	1		1,000.00	1,000.00
Assistant gauger	1		900.00	900.00
Inspectress	1	3.00		1,095.00
Inspector	19	3.00		20,805.00
Night inspector	33	3.00		36,135.00
Messenger	5		840.00	4,200.00
Boatman	2		840.00	1,680.00
Laborer	32		840.00	26,880.00
Watchman	4		780.00	3,120.00
Total	218			296,595.00
Naval office:				
Naval officer	1		5,000.00	5,000.00
Deputy naval officer	1		3,125.00	3,125.00
Clerk and cashier	1		1,800.00	1,800.00
Do	3		1,800.00	5,400.00
Do	3		1,600.00	4,800.00
Do	1		1,400.00	1,400.00
Do	1		1,200.00	1,200.00
Do	1		1,000.00	1,000.00
Total	12			23,725.00

*Reimbursable to the Government.

Estimate of expenses for collecting the revenue from customs for the fiscal year ending June 30, 1893, etc.—Continued.

Designation.	No.	Compensation.		Aggregate.
		Per diem.	Per annum.	
WASHINGTON—continued.				
Port of Port Townsend, district of Puget Sound—Cont'd.				
Inspector and boatman	1	$2.00		$730.00
Boatman	2		*$782.50	1,565.00
Deputy collector	1	4.00		1,460.00
Inspector	1	4.00		1,460.00
Do	11	3.50		14,052.50
Do	1	†3.50		1,277.50
Deputy collector and inspector	1	3.00		1,095.00
Night inspector	2	2.50		1,825.00
Storekeeper	1		†1,200.00	1,200.00
Do	2		‡100.00	2,400.00
Total	42			55,612.50
ALASKA.				
Port of Sitka, district of Alaska:				
Collector	1		3,200.00	3,200.00
Deputy collector and inspector	1		1,800.00	1,800.00
Deputy collector	1		§1,500.00	1,500.00
Do	4		§1,400.00	5,600.00
Inspector afloat	2	3.00		2,190.00
Inspector	1	‖3.00		540.00
Watchman	1	**3.00		432.00
Do	1	††3.00		288.00
Total	12			15,550.00
NORTH AND SOUTH DAKOTA.				
Port of Pembina, district of North and South Dakota:				
Collector	1		2,500.00	2,500.00
Deputy collector	1	4.00		1,460.00
Deputy collector and mounted inspector	5	3.50		6,387.50
Deputy collector and inspector	2	3.00		2,190.00
Mounted inspector	1	‡‡3.50		1,277.50
Night inspector	1	3.00		1,095.00
Total	11			14,910.00
ARIZONA.				
Port of Nogales, district of Arizona:				
Collector	1		2,000.00	2,000.00
Deputy collector	1		1,500.00	1,500.00
Do	3		1,200.00	3,600.00
Clerk and inspectress	1		1,200.00	1,200.00
Clerk	1		1,200.00	1,200.00
Deputy collector and mounted inspector	1		1,382.50	1,382.50
Mounted inspector	8	‡‡3.50		10,220.00
Inspector	2	3.00		2,190.00
Assayer (paid by piecework as necessary)	1			
Total	19			23,292.50
Total salaries				5,612,646.70

* Includes 50 cents per diem for rations.
† Reimbursable to the Government.
‡ Per month; reimbursable to the Government.
§ To be in full for salary, fuel, and office expenses.
‖ Not to exceed fifteen days in any one month.
** Not to exceed twelve days in any one month.
†† Not to exceed twenty-four days in any one quarter.
‡‡ Includes 50 cents per diem for horse feed.

Miscellaneous items.

One supervising special agent, $10	$3,650.00
Eighteen special agents at $8, and nine at $6 per diem	72,270.00
Expenses of special agents	18,000.00
Salaries and expenses of special inspectors	75,000.00
Prevention and detection of frauds upon the revenue (act of March 3d, 1879)	50,000.00
Salaries of two inspectors, Isthmus of Panama	5,000.00
Commissions on duties collected	250,000.00
Temporary customs employés, temporary labor, cartage, rent, contingent expenses, stationery and expenses thereto pertaining, miscellaneous traveling expenses, sundries—including freightage, expenses of district attorneys, and miscellaneous engraving	1,000,000.00
Total	1,473,920.00
Grand total	7,086,566.70

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WAR DEPARTMENT,
Washington, December 8, 1891.

SIR: In accordance with the requirements of the "act making appropriations for fortifications and other works of defense, for the armament thereof, for the procurement of heavy ordnance for trial and service, and for other purposes," approved February 24, 1891, I have the honor to transmit herewith for the information of Congress the report of the Board of Ordnance and Fortification, embracing the operations of the Board from its organization to October 30, 1891.

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

Special Orders, No. 249.

HEADQUARTERS OF THE ARMY,
ADJUTANT-GENERAL'S OFFICE,
Washington, October 25, 1888.

[Extract.]

* * * * * * *

7. The following order has been received from the War Department:

WAR DEPARTMENT,
Washington City, October 25, 1888.

Under a provision of an act of Congress entitled "An act making appropriations for fortifications and other works of defense, and for the armament thereof, for the procurement of heavy ordnance for trial and service, and for other purposes," approved September 22, 1888, a Board, to consist of the officers hereinafter named, "to be called and known as the Board of Ordnance and Fortification," and to "be under the direction of the Secretary of War and subject to his supervision and control in all respects," is hereby appointed "to provide suitable regulations for the inspection of guns and materials at all stages of manufacture to the extent necessary to protect fully the interests of the United States, and generally to provide such regulations concerning matters within said Board's operations as shall be necessary to carry out to the best advantage all duties committed to its charge."

Maj. Gen. John M. Schofield, U. S. Army.
Col. Henry L. Abbot, Corps of Engineers.
Col. Henry W. Closson, Fourth Artillery.
Lieut. Col. Alfred Mordecai, Ordnance Department.
Capt. Charles C. Morrison, Ordnance Department, is detailed as recorder of the Board.

WM. C. ENDICOTT,
Secretary of War.

* * * * * * *

By command of Maj. Gen. SCHOFIELD,

R. C. DRUM,
Adjutant-General.

The Board as thus constituted met and organized October 30, 1888.

These designations for members of the Board have remained unchanged to the present time, but Capt. Charles C. Morrison, Ordnance Department, was relieved as recorder of the Board, and Capt. D. M. Taylor, Ordnance Department, was detailed in his place, Capt. Taylor assuming his duties January 14, 1890.

By the fortification act of February 24, 1891, provision was made for an increase of the Board as follows:

And one additional member shall be added to the Board of Ordnance and Fortification, who shall be a civilian and not an ex-officer of the Regular Army or Navy, and he shall be nominated by the President, and by and with the advice and consent of the Senate appointed, and he shall be paid a salary of five thousand dollars per annum and actual travelling expenses when travelling on duty.

In accordance with this law the President on the first day of July, 1891, appointed Hon. Byron M. Cutcheon, of Michigan, as such civilian member of the Board, who duly qualified and entered at once upon the performance of his duties as such.

THE JURISDICTION OF THE BOARD.

The act before recited requires the Board to make a report (1) showing "the general operations of the Board," and (2) to "give a detailed statement of all contracts, allotments, and expenditures made by the Board."

It will be observed that according to the organic act (September 22, 1888) the Board is to be "under the direction of the Secretary of War and subject to his supervision and control in all respects," upon the *one hand, and that* "subject to the foregoing provisions the expendi-

ture shall be made by the several bureaus of the War Department having jurisdiction of the same, under existing law," upon the other hand.

The Board is thus only advisory to the Secretary of War, and itself makes no contracts and expends no appropriation except for the necessary expenses of the Board.

So far as contracts and expenditure of appropriations are concerned its functions are to make recommendations to the Secretary of War.

In the matter of allotments its recommendations are advisory only, and may be approved or disapproved by him.

By the acts of 1888 and 1889 the appropriation for fortification and armament is placed "under the direct supervision of the Board of Ordnance and Fortification." Under the acts of 1890 and 1891 that part of the appropriation which relates to armament of fortifications is placed under such supervision, and by the act of 1890, the appropriation for gun and mortar batteries and for the procurement of land for sites, also is so placed.

With this statement it will be understood when it is said that it is impossible to report "contracts made by the Board," inasmuch as no contracts have been made by it.

In order, however, to afford as far as possible the information desired, the Board incorporates herewith a detailed statement, showing all appropriations made (beginning with that of September 22, 1888), subject to the supervision of the Board, also a detailed statement showing all allotments made or recommended by the Board from such appropriations. For convenience of reference these two statements are combined, and are made Appendix A. A detailed statement is also appended showing all expenditures made by the Board.

From these several statements it will be seen that the total amount appropriated subject to the supervision of the Board to date has been $11,385,332; and in addition thereto the sum of $3,500,000 will be required to fulfill the contract with the Bethlehem Iron Company, approved by this Board, which will need to be estimated and appropriated from year to year, as the contract progresses.

The total amount allotted by the Board has been $10,526,625.26.

And the entire amount expended by the Board for its expenses to the date of this report has been $5,567.50.

GENERAL OPERATIONS.

Under the head of "General Operations of the Board" a vast number of subjects have come before it, embracing almost every possible form of project for fortifications and armament.

To all of these the Board has given careful and conscientious attention, though the greater number have been such as could not be adopted or recommended. There is one hopeful and favorable feature, however, in all this, and that is that it shows the great and widespread interest and activity in the matter of national defense.

To specify the action taken on them all would be to transcribe the proceedings of the Board, which fill several volumes. It will suffice to state briefly the action taken upon each of the most important elements of fortification and armament which have been considered.

ARMY GUN FACTORY.

One of the most important and interesting steps in the progress of the new policy of *seacoast defense inaugurated* by the act of Septem-

ber 22, 1888, is the installation of the Army gun factory at Watervliet Arsenal, West Troy, N. Y. In fact it may be said to have been the initial step in that policy.

The act above named provided—

> For the erection, purchase, or manufacture of the necessary buildings and other structures, machinery, tools, and fixtures for an Army gun factory for finishing and assembling heavy ordnance, to be erected at the Watervliet Arsenal, West Troy, New York, seven hundred thousand dollars.

This amount became at once available; the Board on November 6, 1888, allotted the full amount for the purpose intended, based upon plans for the factory, which had already been prepared by the Ordnance Department and submitted to the Board, so that by December, 1888, it became possible to let some of the contracts for construction and to begin work.

For details of the progress of construction reference is made to the annual reports of the Chief of Ordnance for 1889 and 1890, under which Department the work has been done.

In about two years from the making of the appropriation the north wing of the factory was so far completed as to be occupied for its intended use, with the machinery, except the heaviest, in place.

By September 30, 1890, the whole amount of the original appropriation of $700,000 had been expended or obligated by contracts.

By the act of August 18, 1890, a further sum of $526,300 was appropriated for the completion and equipment of the factory, of which $165,000 was "for machinery to complete to full capacity the present gun-factory building," and $320,000 was "for boring and turning-lathes, rifling machine, and 80-ton traveling crane, fully equipped for the manufacture of 12-inch guns," and the remainder was for miscellaneous purposes.

This appropriation was apportioned by act of Congress to the special purposes for which it was intended, and required only the formal action of the Board. This allotment was promptly made. So far as it has been expended it has been done through the Ordnance Department having jurisdiction of the same.

By the act of February 24, 1891, provision is made for the erection and equipment of the south wing of the gun factory; $248,743 being appropriated for the building, including ways for traveling crane, and $268,000 for machinery, tools, power plant and fixtures.

The Board has not visited the work since this appropriation was allotted, but is informed that good progress has been made with the building, and that contracts for its equipment are progressing satisfactorily.

Other appropriations, amounting to $29,500, for completing the equipment of the gun factory, were made by the act of 1891, making the total amount appropriated for that object to date $1,772,543, without taking into account the value of the site.

The entire amount has been alloted, as shown by the following statement:

Allotments for Army gun factory.

ACT SEPTEMBER 22, 1888.

1888.		
Nov. 6.	Buildings, machinery, tools and fixtures	$680,000
8.	Erection and completion of two sets of officers' quarters	20,000

FORTIFICATION ACT, AUGUST 18, 1890.

1890.			
Sept.	2.	For machinery to complete building to full capacity	$165,000
Oct.	5. 1.	For building for wash room, closets, etc.	12,000
	4.	Fireproof brick office building (not approved until September, 1891)	23,000
Sept.	2.	Railroad sidings, etc., and weighing scale	2,800
		Engine and shafting	3,500
		Boring and turning-lathes, rifling machine, and 80-ton crane	320,000

FORTIFICATION ACT, FEBRUARY 24, 1891.

1891.			
Mar.	25.	To complete erection of south wing	248,743
		For machinery, etc., for south wing	268,000
		Shrinkage pit, etc.	14,000
		Locomotive and cars	9,000
		Wharf repairs, etc.	6,500
		Total	1,772,543

These figures relate to the new gun factory for the fabrication of sea-coast guns of heavy caliber. In addition to the allotments for the new gun factory the Board has been called upon to make and has made the following allotments to complete the equipment of the old (or small) gun shop at Watervliet, which is engaged in the fabrication of field and siege guns, projectiles and experimental guns, to wit:

Dec. 4, 1889, for making alteration in machinery and for purchase of new machines for experimental guns	$13,888
Oct. 1, 1890, for increase of machinery and plant for manufacture of projectiles and for castings	16,000
Total	29,888

The factory is now turning out guns up to and including 12 inches caliber. The 8-inch gun, the only one which has been fully tested, has proved itself satisfactory.

When completed, as contemplated by the act of 1891, the factory will be equipped for manufacturing all calibers up to and including 12 inches, and the building will be adapted to receive machinery for finishing and assembling 16-inch guns, should Congress hereafter authorize their construction.

The Board has carefully considered this question of additional machinery, and is strongly of opinion and now recommends that it should be of a size adapted to finish and assemble the 16-inch gun. If designed for calibers of only 12 inches or less, it will be unable to work upon guns of a larger size, while if designed for the 16-inch gun it will be entirely serviceable for smaller calibers. If the vacant space in the factory be filled with these smaller tools, much loss of time and needless expense will be incurred in removing and replacing them when Congress elects to commence the manufacture of a larger type. That a larger type than the 12-inch gun is necessary for our coast batteries is certain. No one proposes to reduce the heaviest naval guns below 13.5 inches in caliber, and nothing can be more certain than that land batteries should be equipped with guns of higher power than those to be brought against them. The difficulties of limited flotation, restricted space and excessive weight of armor do not apply to guns mounted on the solid earth. The mere fact that the English 16-inch guns now appear to have insufficient strength, should not condemn the entire class.

Whether that last caliber, or one somewhat smaller, should be selected, and what should be the special type of construction adopted, are questions which may be left unsettled for the present; but in purchasing tools which require years for their fabrication they should be made large enough to meet all the requirements likely to be thrown upon them.

STEEL FORGINGS FOR GUNS.

One of the largest single appropriations which has come under the jurisdiction of the Board, is that contained in section 4 of the act of September 22, 1888, "For the purchase of rough-finished, oil-tempered, and annealed steel for high-power coast defense guns of 8, 10, and 12 inch caliber, $1,500,000."

It devolved upon the Board to prescribe the inspections and tests under which such forgings should be made, and which should become a part of the contracts therefor.

Elaborate "regulations for the inspection of guns and materials at all stages of manufacture to the extent necessary to protect fully the interests of the United States" were formulated by the Ordnance Department and submitted to the Board for its approval.

The Board, after careful and detailed consideration of the proposed regulations, inspections and tests, on November 6, 1888, approved the same, and these inspections and tests are applied to all steel to be used in the construction of any portion of a steel gun or mortar made under the supervision of the Board. A copy is hereto appended marked B.

Usually from two to four test specimens of steel are taken from each end of every tube, jacket, hoop or trunnion band, each piece duly marked so as to denote the location from which it is taken, and subjected to vigorous tests before it is accepted or permitted to be used. These tests are all recorded and reported to the Ordnance Bureau. For an ordinary 10-inch gun not less than sixty-three test specimens are required, and for a 12-inch gun a larger number.

On January 31, 1889, the contract for these forgings was let to the Bethlehem Iron Company for twenty-three sets for 8-inch guns, twenty-three sets for 10-inch guns, and fifteen sets for 12-inch guns, at a total cost of $1,461,982.

This contract is now in course of fulfillment and must be completed, under penalty, by December 1, 1893.

The cost of these forgings is 27⅛ cents per pound for 8-inch guns, and 30½ cents per pound for 10 and 12-inch guns. It is upon these forgings that the Army Gun Factory is now at work.

In anticipation that the forgings procured under the act of 1888 will have been finished and assembled by the close of 1893, an additional appropriation of $800,000 was made by the act of February 24, 1891, for the same purpose, and the contract therefor has been let to the Midvale Steel Company of Philadelphia, that company being the lowest bidder.*

The contract with the Midvale Company is expected to produce 12 8-inch, 12 10-inch and 9 12-inch sets of forgings.

* These forgings are entirely apart from and in addition to the one hundred guns to be completed under the contract of the Bethlehem Iron Company, for which that company will furnish its own forgings.

It will be seen, therefore, that provision has already been made for the following enumerated forgings for heavy guns:

	8-inch.	10-inch.	12-inch.
	Sets.	*Sets.*	*Sets.*
Act 1888	23	23	15
Act 1891	12	12	9
Contract guns (1890)	25	50	25
Total	60	85	49

The total number of guns required under the approved project of fortifications (report of the Board of Fortifications and other Defenses, 1886) will be as follows: 102 8-inch, 222 10-inch, 203 12-inch, thus leaving 42 8-inch, 137 10-inch and 154 12-inch to be provided for.

In addition to these, the project calls for 44 16-inch and 6 14-inch guns, for which no appropriation or provision has yet been made; also for 24 10-inch and 700 12-inch seacoast mortars, for 73 only of which provision has been made. Carriages are yet to be provided for substantially all, both guns and mortars.

The following table will show the allotments which have been made for gun forgings of all calibers to date:

Allotments for forgings.

ACT SEPTEMBER 22, 1888.

Nov. 6, 1888.	Steel for forgings for 8, 10 and 12 inch guns	$1,500,000
Dec. 13, 1888.	Drawings and forgings for 3.2-inch gun, to be fitted with Driggs' breech mechanism, including small tools	2,857

ARMY APPROPRIATION ACT MARCH 2, 1889.

May 2, 1890.	Steel forgings, 10 5-inch siege guns	20,000
Oct. 1, 1890.	Steel forgings, 10 7-inch howitzers	18,000
Mar. 26, 1891.	Steel forgings, 16 3.6-inch field guns	2,000

ACT FEBRUARY 24, 1891.

Mar. 25, 1891.	Steel for high power guns	800,000
	Total	2,342,857

CONTRACT GUNS.

The fortification act of September 22, 1888, provided for contract guns in the following manner, viz.:

Whenever any party shall present for test a completed single-charge breech-loading steel gun of ten or twelve inches caliber, and of weight and dimensions to be prescribed by the Board with the proper supply of ammunition for the test of the same, such gun shall, in the presence of the party presenting it, be subjected to such tests as the Board shall have prescribed; and should such gun be shown to the satisfaction of the Board by such tests to fulfill the requirements previously prescribed in respect to accuracy, range, power, endurance, and general efficiency, the gun and ammunition shall be paid for at a fair valuation, including cost of transportation, and contract shall be made at a price reasonable in the opinion of the Board, with the party presenting the best of such guns, for a further supply of similar guns, to be subjected to the usual service test before acceptance, the experimental gun and all guns purchased hereunder to be subject to inspection at each stage of manufacture, as follows, namely: For not less than fifty ten-inch steel guns; and for not less than fifty twelve-inch steel guns.

The Board on January 11, 1889, after careful consideration of the subject, prescribed tests weights and dimensions, as required by the provisions of the law for any guns which may be presented under this section, and, although the law did not require bids to be invited, prepared a circular letter (copy of which is appended, marked C), which was extensively circulated among such persons as were thought to be likely to present guns for test. Up to the present time no proposition has been received from any party to construct a gun under this act.

Hundred gun contract.—The fortification act of August 18, 1890, contained the following provision:

SEC. 2. That the Secretary of War is hereby authorized and directed to purchase under contract, after due advertisement inviting proposals, and at prices which the Board of Ordnance and Fortification shall adjudge to be fair to the manufacturer and for the interest of the United States, twenty-five eight-inch, fifty ten-inch, and twenty-five twelve-inch guns, all of which guns shall be breech-loading single-charge steel guns, and of weight and dimensions to be prescribed by the Board, and shall fulfill the condititions hereinafter provided: *Provided*, That if two or more persons, citizens of the United States, submit proposals to furnish said guns, either in part or in whole, at prices not materially different from each other, contracts may be awarded, in such proportion, among the citizens submitting such proposals as the Secretary of War may direct. One type gun of each of the above-mentioned caliber, with the proper supply of ammunition therefor, shall be presented for test at such place and within such time as the contract shall provide, and shall be subjected to such tests in respect to accuracy, range, power, endurance, and general efficiency as the Board of Ordnance and Fortification shall have prescribed. All the other guns of each caliber, with the proper supply of ammunition, shall be delivered at such place and within such times as the contract shall provide, and shall be subjected to the ordinary service test of ten rounds with the full charge and weight of projectile, which shall develop the standard power prescribed for the gun. If the type gun sustains the prescribed test to the satisfaction of the Board of Ordnance and Fortification, it and each of the other guns which sustains the ordinary service test, and the ammunition expended in such tests, shall be accepted under the contract. All guns manufactured under these contracts, including the type guns, shall be subjected to inspection at all stages of manufacture, and no change whatever shall be made in the material, mode of manufacture, or dimensions of the guns for service from those employed in the type gun without the approval of the Secretary of War. Payment for each gun and ammunition for testing same, including cost of transportation, shall be made upon the satisfactory completion of the prescribed test for that gun. All tests of guns shall be made in the presence of the Board and of the person presenting the gun, or his authorized agent, and due regard shall be paid to suggestions offered by him which respect the mode of making such test.

That under the provisions of this section there shall not be expended or contract or contracts entered into involving the Government in an aggregate expenditure exceeding three million seven hundred and seventy-five thousand dollars, nor an expenditure on the part of the Government in any one fiscal year in excess of one million dollars. And all guns and materials purchased under the authority of this section shall be of American manufacture and furnished by citizens of the United States.

In regard to this provision of the law it may be observed: First, that all guns and materials purchased under the authority of this section must be of American material and manufacture, and furnished by citizens of the United States; second, it calls for the purchase of the finished and completed guns from forgings to be furnished by the contracting parties; and third, that the contractor is not confined to any particular type of gun, so long as they are breech-loading, single-charge, steel guns. They are required to be of weight and dimensions prescribed by the Board of Ordnance and Fortification, and to be subjected to such tests as that Board shall have prescribed.

The obvious purpose of this legislation seemed to the Board to be: First, to encourage and induce the establishment of at least one gun plant in the United States, in addition to the Government factories, capable of turning out 8, 10, and 12-inch steel guns by American labor and skill, from American materials; and second, to encourage and give opportunity to American inventive and mechanical genius, to bring for-

ard new types of guns, subject to tests to be prescribed, to compete ith the adopted Ordnance Department type of gun now being pro-uced.

In this connection three functions were devolved upon the Board of rdnance and Fortification: the first, to prescribe the weight and di-ensions of the several calibers of guns; the second, to adjudge whether he prices proposed were "fair to the manufacturer and for the inter-sts of the United States;" and the third, to prescribe and supervise he proper tests of the type guns which should be produced and offered.

On October 8, 1890, proposals were invited for furnishing these hun-red guns under contract, in accordance with the foregoing act; but lthough until December 18 was allowed for opening the proposals, none ere received, manufacturers appearing to be unprepared to make bids, oubtless on account of the costly nature of the plant required, and, erhaps, on account of the amount of the appropriation being limited) $3,775,000.

By the fortification act approved February 24, 1891, the limit of ex-enditure was increased to $4,250,000, $50,000 being "reserved to cover ll expenses other than powder and projectiles incident to the tests nd inspection of the guns;" and also the Secretary of War was "author-zed to contract thereunder for such less number of guns than one hun-lred as he may deem for the best interests of the Government."

After this supplemental legislation the Department again, on May 1891, advertised for proposals for the 25 8-inch, 50 10-inch and 25 12-inch guns.

Bids having been opened on July 13, 1891, it was found that proposals ad been submitted by three parties: The Midvale Steel Company, of Pennsylvania; the South Boston Iron Works, of Boston, Mass.; and the Bethlehem Iron Company, of Bethlehem, Pa.

These proposals were submitted to the Board to adjudge whether the prices proposed were "fair to the manufacturers and for the interest of the United States."

It was found that the proposals of the Bethlehem Iron Company were so far below those of their competitors, that they were practically the only ones before the Board for consideration. After elaborate hearings both of the officers of the company and of the representatives of the Ordnance Department, and after most careful deliberation, the Board arrived at the following conclusions, to-wit:

The Board is of opinion:

(1) That the interest of the United States does not require that guns should be turned out at a rate materially greater than carriages and emplacements can be provided, suitable appropriations therefor being made to make them available for use.

(2) That the interest of the United States does not require that guns should be procured by contract to the displacement of the plant and skilled labor already provided for at the Army gun factory at Watervliet.

(3) That considering the necessary appropriations for maintenance and operation of the gun factory, for additional forgings to keep it in operation, for carriages and emplacements, for mortars and carriages therefor, and other necessary objects of defense and armament, it is not for the interest of the United States to hasten the contract guns to a degree likely to cripple appropriations for these other necessary objects.

(4) That it is for the interest of the United States to accept that bid of the Bethlehem works which, conformably with the foregoing propositions, will secure the establishment of a private gun plant within a reasonable period, with the least cost for plant to the United States.

(5) That Schedule E, in the opinion of the Board, is the schedule which most nearly conforms to these conditions. The Board, therefore, in conformity with the duty imposed on it by the fortification acts approved August 18, 1890, and February 24, 1891, adjudges the prices named in the proposals of the Bethlehem Iron Company of July 11, 1891, under Schedule E, to be fair to the manufacturer and for the interest of the United States.

The Board recommends that a contract be entered into with the Bethlehem Iron Company for the manufacture of 100 breech-loading single-charge built-up forged-steel rifled guns, under Schedule E of its proposal of July 11, 1891, viz., 25 8-inch breech-loading rifles each for $17,246.55, including ten rounds of ammunition complete; the first gun manufactured to be the type gun, which shall be subjected to such tests as the Board of Ordnance and Fortification shall hereafter prescribe; that the ammunition required for these tests over and above the ten rounds supplied with the gun shall be furnished by the company at the price of $71.09 per round; 50 10-inch breech-loading rifles, each for $35,747.58, including ten rounds of ammunition complete; the first gun manufactured to be the type gun, which shall be subjected to such tests as the Board of Ordnance and Fortification shall hereafter prescribe; that the ammunition required for these tests over and above the ten rounds supplied with the gun shall be furnished by the company at the price of $131.06 per round; 25 12-inch breech-loading rifles, each for $54,473.22, including ten rounds of ammunition complete; the first gun manufactured to be the type gun, which shall be subjected to such tests as the Board of Ordnance and Fortification shall hereafter prescribe; that the ammunition required for these tests over and above the ten rounds supplied with the gun shall be furnished by the company at the price of $217.06 per round.

The Bethlehem Iron Company before the contract is made should submit for the approval of the Board of Ordnance and Fortification detailed drawings of each caliber of gun contemplated under its proposal of the 11th of July, 1891. The physical qualities of the metal, the tests to be made of it, and all details of assembling the parts and all points relating to the construction of the guns required to carry out the proposals of the company, should be approved by the Chief of Ordnance before being submitted to the Board.

The Board is further of opinion that the Chief of Ordnance should be authorized to make agreement with the contractor so as to admit of such changes being made, from time to time, in the guns to be furnished as may be necessary to keep abreast of any improvements that may hereafter be attained in gun construction.

To fully understand the foregoing action of the Board it should be stated that the Bethlehem Iron Company submitted five distinct proposals, with prices dependent on the time of the delivery of the guns; the highest price being related to the shortest time of delivery and depending upon the magnitude of the plant required and the consequent greater cost of production.

The length of time required for the production and delivery of the one hundred guns, including the time required for erection of plant and construction and test of type gun, under the lowest bid, is estimated at eleven years and nine months. But as the company has signified its purpose of adopting the Ordnance Department standard type gun, already completed and in part tested, it is believed that a less time will be sufficient.

As will be seen the Board has recommended the acceptance of the lowest bid and longest time, which will distribute the cost of the guns over at least ten years, and require no large appropriation in any one year.

The great desideratum, however, provided by this legislation, as understood by the Board, is to secure the establishment in the United States of an independent gun plant, capable of producing finished guns of heavy caliber, which, in case of emergency, may be employed to supplement the Government gun factories in the armament of our fortifications.

Another consideration which had much weight was that it would permit the Army gun factory to be turned to other not less necessary gun work, and thus expedite by several years the completion of the defense of our principal seaports.

It also devolved upon the Board to prescribe the weight, dimensions, inspections, physical properties and tests of such guns as should be offered, which duty the Board performed, and these specifications were embodied with the instructions to bidders, and became incorporated in every bid made.

The following are the conditions prescribed by the Board as those to which the 8, 10 and 12-inch single-charge steel breech-loading guns to be procured under section 2 of the fortification act, approved August 18, 1890, and the fortification act, approved February 24, 1891, must conform, viz.:

FOR A GUN OF 8-INCH CALIBER.

The weight shall be about 14½ tons (long).

The length of bore shall be 32 calibers, measured from the face of the obturator to the face of the muzzle of the gun. (In order that the gun may not require a special carriage for its proof, it is desirable that the diameter of the trunnions be 10 inches, and the distance between rimbases 32.5 inches.)

The power shall be such as may be expressed by a muzzle energy of not less than 7,600 foot-tons.

The range shall for 20 degrees elevation be about 11,000 yards, and corresponding ranges shall be obtained with lower elevations.

The standard of accuracy shall be as given in the following table, and shall be approximately attained:

Table of accuracy—25 per cent rectangles.

Range.	Vertical rectangle.		Horizontal rectangle.	
	Height.	Width.	Length.	Width.
Yards.	*Feet.*	*Feet.*	*Yards.*	*Yards.*
1,500	1.4	1.0	.....	.....
3,000	3.4	2.9	.....	.....
6,000	.....	.....	29.7	4.2
8,000	.....	.....	38.9	6.7
10,000	.....	.....	48.5	9.2

The endurance test should not be less than 350 rounds with full charges. After 300 or more rounds may have been fired, the gun may be lined wholly or in part, when at least 50 rounds more will be fired to fully test the strength of the construction. After this, the general soundness and efficiency of the gun should not be materially impaired, except that a reasonable amount of erosion will be admitted. Should any material modification of the construction be made during the trial, at least 50 rounds, with full charges, shall be fired thereafter.

The weight of projectile to be used with full charge shall be about 300 pounds. Three hundred and fifty rounds of ammunition shall be the proper amount to be supplied with the gun for test.

As a proof of general efficiency the breech mechanism should work freely and be convenient for operating, the opening and closing of the breech to be performed without great difficulty by one man. The projectiles shall admit of being readily handled, inserted, and centered in the bore, and not be subject to injury or deformation either in handling or transportation.

A rapidity of fire of 20 rounds per hour shall be attainable, using such appliances for loading as are employed by the Ordnance Department, U. S. Army.

The repairs allowable during the entire trial of a gun, exclusive of the insertion of a lining tube, will be confined to repairing or renewing parts injured during trial. No alterations that may affect the general construction of any part will be made without the sanction of the Board.

FOR A GUN OF 10 INCHES CALIBER.

The weight shall be about 30 tons (long).

The length of bore 34 calibers, measured from the face of the obturator to the face of the muzzle of the gun. (In order that the gun may not require a special carriage for its proof, it is desirable that the diameter of the trunnions be 12 inches and the distance between rimbases 42 inches).

The power shall be such as may be expressed by a muzzle energy of not less than 15,000 foot-tons.

The range shall for 20 degrees of elevation be about 13,650 yards, and corresponding ranges shall be obtained with lower elevations.

The standard of accuracy shall be the same as that prescribed for an 8-inch gun.

The endurance shall not be less than 300 rounds with full charges, and a lining may be inserted after 250 rounds.

The weight of projectile with full charges shall be about 575 pounds.

Other conditions for test shall be the same as for an 8-inch gun, except that under general efficiency a rapidity of fire of fifteen rounds per hour shall be attainable.

FOR A GUN OF 12 INCHES CALIBER.

The weight shall be about 52 tons.

The length of bore shall be 34 calibers. (In order that the gun may not require a special carriage for its proof, it is desirable that the diameter of trunnions be 14.5 inches and the distance between rimbases 49.8 inches).

The power shall be such as may be expressed by a muzzle energy of not less than 26,000 foot-tons.

The range shall for 20 degrees elevation be about 14,700 yards, and corresponding ranges shall be attained with lower elevations. The accuracy shall be the same as that prescribed for an 8-inch gun.

The endurance shall not be less than 250 rounds, and a lining may be inserted after 200 rounds.

The weight of projectile for full charges shall be about 1,000 pounds.

Other conditions of test shall be the same as for an 8-inch gun, except that under general efficiency a rapidity of fire of 10 rounds per hour shall be attainable.

The judgment and recommendations of the Board as above set forth have been approved by the Secretary of War, and it is expected that the execution of the contract may soon be in progress.

Other gun contracts.—Under the act of August 18, 1890, the War Department has entered into contract with the West Point Foundry for finishiug and assembling eleven 8-inch guns to be made from forgings procured under act of September 22, 1888. These guns are being finished and assembled subject to inspections and tests prescribed by the Board.

INCREASED LENGTH OF HEAVY GUNS.

With the increase in weight of metal thrown by heavy guns has come a demand for slow-burning powders to avoid excessive strains in moving these masses, and such powders in their turn have demanded an increase in the length of the bore of the gun that their full effect may be obtained. Consequently, in foreign services there has been during the past few years a steady increase in the length of guns of 6 to 12 inches caliber. Latterly it has been proposed to increase the total length of our 12-inch breech-loading rifles from 36½ calibers to 40. For such guns of this caliber as are to be mounted on gun lifts or disappearing carriages, any increase of either length or weight is so undesirable that for the present, at least, it is not to be considered. It is, however, very desirable that we should know by actual experience what are the merits and demerits of increased length, and as some of the guns of this caliber are to be mounted on nondisappearing carriages, the Board has recommended that the Chief of Ordnance be authorized to obtain forgings for not to exceed seven guns of this caliber, of 40 calibers total length, and that one of them be finished and tested as soon as possible, but that their manufacture be not allowed to unduly interfere with that of the shorter guns.

EXPERIMENTAL GUNS.

Several types of experimental guns have received the attention of the Board, and are now under fabrication in various stages of progress. The first of these to which the Board calls attention is:

The Haskell multicharge gun, in process of construction by the Has-

kell Multicharge Ordnance Company, at Reading, Pa. Under section 6 of the act of September 22, 1888, the Board on July 20, 1889, allotted $28,000 for the purchase of one 8-inch Haskell multicharge dynamite gun of the model of February, 1889, payment to be made on delivery at proving ground. Subsequently, April 9, 1890, upon request of the Haskell Multicharge Ordnance Company, the Board authorized the substitution of the 10-inch high power steel multicharge gun, at the company's option, for the dynamite gun before provided for, and allotted the sum of $55,000, or so much thereof as might be necessary for the purpose, under the act of September 22, 1888, payments therefor to be made in four equal installments as the Secretary of War might direct.

On September 3, 1890, the Board was advised by J. R. Haskell, superintendent of the Haskell Company, that his plans for the gun were then nearly completed and his estimates in process of preparation, but what progress has been made in the actual fabrication of the gun the Board is not advised.

This gun is not subject to test of metal or parts by the Government during process of fabrication, nor does it involve the purchase, necessarily, of any other of this type.

Wire-wound guns.—Several guns of the wire-wound type have been brought to the attention of the Board, and two are now in course of fabrication under allotments made by the Board. The first of these is what is known as the Crozier wire-wound gun, which has been approved by the Ordnance Department, and is also known as the Ordnance Department wire-wound gun.

On November 7, 1888, the Board received from the Chief of Ordnance a communication, accompanied by drawings and estimates, for the construction of the Crozier wire-wound gun, and an allotment was made therefor of $32,000. On June 6, 1890, an additional allotment of $14,000 was made for the completion of this gun, on recommendation of the Chief of Ordnance.

This gun is now in course of fabrication by the Ordnance Department at the Army gun factory, and considerable progress has been made with it. At last accounts the steel wire had all been delivered, and the jacket, trunnion hoop and chase hoops, made of cast steel, oil-tempered and annealed, have been contracted for with the Standard Steel Casting Company. The Board is not advised as to the present precise condition of this gun.

This gun consists principally of a steel tube, overlaid from breech to muzzle with a practically continuous covering of steel wire, wound in layers, with a jacket cylinder enveloping the steel wire over the reinforce, and a continuous layer of hoops enveloping the wire over the chase of the gun from the trunnion hoop forward to the muzzle.

Another experimental gun of the wire-wound type now approaching completion is known as the Woodbridge 10-inch wire-wound gun. The fabrication of this gun had been commenced before the organization of this Board, but had been arrested for want of appropriations. For its completion the Board allotted on June 12, 1889, the sum of $20,000.

This is a breech-loading rifle of steel, and consists principally of an inner steel-tube, overlaid for the rear half of its length with a cylinder of closely-fitted steel staves, and then wound with steel wire, tinned, which is afterwards soldered. The entire length of the gun is wire-wound, the wire lying in direct contact with the tube forward of the staves and forming the exterior of the gun, except where covered with the trunnion hoop and sleeve; but the wire portion is separated in the whole length into three sections by steel rings or bands, screwed and shrunk on the cylinder *of staves or the tube*

The inventor of this gun, Dr. W. E. Woodbridge, is employed as an assistant at the Watertown Arsenal in connection with its manufacture.

On May 8, 1891, the Chief of Ordnance communicated to the Board his opinion that this gun might be finished in six months from that date, and asked for a further allotment of $2,818 for its completion, which allotment was made by the Board. As the making of this gun has been long delayed, the Board urged "that the work be pushed forward with all due expedition and completed without unnecessary delay." The Board is not advised as to the present condition of this gun.

Still another experimental wire-wound gun, which was approaching completion at the organization of the Board, was the Woodbridge cast-iron wire-wound gun, for the completion of which the Board made an allotment of $1,500. The gun is completed and is now at the ordnance proving ground at Sandy Hook.

Application has been made to the Board to make allotments for other guns of the wire-wound and segmental types, but this has not been deemed wise until the guns above named, involving like principles of construction, have been completed and tested. But the Board has made an allotment of $3,031 for the purchase of ammunition for the test of the Brown segmental wire-wound gun, and has also made an allotment for adapting a carriage for proving or testing the same.

CAST-IRON BREECH-LOADING MORTARS.

Section 6 of the act of September 22, 1888, provided that—

SEC. 6. Whenever any party shall present for test a completed cast-iron breech-loading mortar of twelve inches caliber, of about thirty-two thousand pounds weight, with a proper supply of ammunition therefor not exceeding two hundred rounds, such mortar shall be tested in the presence of the party presenting the same, and should it be shown to the satisfaction of the Board by such tests to be equal in accuracy, range, power, endurance, material, and general efficiency to the twelve-inch cast-iron steel-hooped breech-loading mortar now at Sandy Hook, the mortar and ammunition shall be paid for, including cost of transportation, and contract be made for a further supply of not less than fifty and not more than one hundred, at such reasonable cost as the Board herein provided for shall determine, not to exceed six thousand five hundred dollars each. The entire number to be delivered in one year from date of contract. Said mortar and all which may be contracted for under this provision shall be subject to inspection at each stage of manufacture.

The South Boston Iron Works proposed to present a cast-iron mortar for test under the provisions of this section.

The terms of the statute required that the mortar presented for test should be "shown to the satisfaction of the Board by such tests to be equal in accuracy, range, power, endurance, material, and general efficiency to the 12-inch cast-iron steel-hooped breech-loading mortar now at Sandy Hook."

After much delay the mortar was completed and presented, when a question arose between the Board and the manufacturers as to the correct construction to be placed upon the statute as to the test of the mortar; the manufacturers contending that the test should be limited to 200 rounds, and the Board declaring its intention that the test should continue until the question of equality of "endurance" was decided.

Pending this controversy, however, the question was settled by the bursting of the mortar at the twentieth round. A full report of the firings and the result thereof was submitted to Congress by the Secretary of War January 27, 1890, in House Ex. Doc. 158, first session Fifty-first Congress, to which reference is made for a full history of this trial. A copy is appended hereto marked D.

No other cast-iron breech-loading mortar has been presented for test *under said section.*

The Board regards this test as confirming its opinion of the unreliability of cast iron as a material for high-power guns and mortars, and in view of the result now recommends the repeal of so much of section 6 of the act of September 22, 1888, as relates to the purchase of cast iron mortars of this type.

CAST IRON MORTARS HOOPED WITH STEEL.

Section 5 of the act of September 22, 1888, appropriated $250,000 "For the purchase of material for, and the manufacture of, 12-inch breech-loading rifled mortars of cast iron, hooped with steel, of about 32,000 pounds weight, similar to, and equal in range, power, and accuracy of fire to the 12-inch breech-loading mortar, cast iron, steel-hooped, now at the ordnance proving ground, Sandy Hook, N. J., said mortars to be subject to inspection in all stages of manufacture."

The bodies of these mortars, thirty in number, were put under contract to the Builders Iron Foundry, Providence, R. I.; and the forgings for the steel hoops and breech mechanism for the same to the Midvale Steel Company, of Philadelphia.

Twelve of these mortars have been delivered and are now ready for proof at the proving grounds at Sandy Hook.

All the mortars under this contract should be completed by August, 1892.

The test mortar of this type, which has been thoroughly tried, has proved itself an efficient and accurate arm for protecting harbor channels, where a vertical fire is desired; but in view of the greater range, power, and endurance of the all-steel mortar of the same type and caliber, it may well be considered whether, in the end, it will not be true economy to discontinue the manufacture of the cast-iron body, and to make our mortars, as we now do our guns, entirely of forged steel.

By the act of August 18, 1890, a further appropriation of $400,000 was made for cast-iron steel-hooped mortars, which was duly allotted, and contracts have been entered into for forty-three additional mortars. The contract for the cast-iron bodies for these has been let to the South Boston Iron Works, and the steel forgings therefor to the Midvale Steel Company. The cast-iron bodies are to be completed by September 27, 1892, and the mortars ready for delivery within six months after receipt of the forgings. The delivery of these forty-three mortars should therefore commence about April, 1893, and when delivered will complete the seventy-three now provided for.

ALL-STEEL 12-INCH MORTARS.

The Board on October 10, 1889, made allotment, under the act of 1888, of $15,000 for the construction of a forged steel built-up mortar of 12 inches caliber, which amount, with subsequent allotments amounting to $2,850, makes the total cost of the mortar $17,850. The mortar has been completed at the Army Gun Factory, and is now at the ordnance proving grounds at Sandy Hook undergoing test. With this more powerful mortar it is expected to obtain a range of about 8 miles.

SEACOAST GUN CARRIAGES.

The greater weight and power of modern seacoast guns render the metallic gun carriages now on hand unsuited and insufficient for the new service.

The Government has on hand a large stock of carriages designed for the 10 and 15-inch smoothbore guns, which by alteration and strengthening can be adapted to the mounting of the 8-inch converted rifle and the 15-inch smoothbore gun, using increased charges.

Appropriations amounting to $250,000 have been made in the last three years for such alterations, which are going on principally at Watertown Arsenal, Massachusetts.

An appropriation of $27,000 has also been made by the act of 1891 for increasing the facilities of this arsenal in making such alterations.

Besides this, the sum of $100.000 was appropriated by the act of February 24, 1891, for carriages for the new steel breech-loading seacoast guns, procured under the act of September 22, 1888.

In view of the forward condition of the Army gun factory, and of the probable early execution of the hundred-gun contract with the Bethlehem Iron Company, the time would appear to have arrived for the energetic prosecution of the work of providing carriages for the new guns.

In these days of naval range-finders, machine guns, small arms of wonderful precision, and smokeless powders, the handling of heavy guns mounted upon ordinary barbette carriages on low sites is certain to be productive of such destructive results as to forbid its being attempted. The Board has therefore had under earnest consideration various types of disappearing gun carriages, and has also recommended an allotment for a gun lift for 12-inch guns, which is now in course of construction at Sandy Hook, N. J.

A pneumatic gun carriage of the disappearing type for a 10-inch gun, for which allotment was recommended by the Board, has been completed, and is now in position at the same place awaiting test, which the Board expects will be made during the month of November. Of the other designs submitted to the Board only two have been recommended for trial, and these are now in process of construction. They are the Gordon and the modified Buffington carriages. Of the former, a carriage for a 10-inch gun, and of the latter, carriages for a 10-inch and for an 8-inch gun are under construction.

The construction for drill purposes of an experimental nondisappearing barbette carriage for an 8-inch breech-loading rifle, steel, upon designs submitted to and approved by the Board, has also been authorized.

In a matter of so much consequence the Board has deemed it of the utmost importance to proceed with care, and not to recommend large expenditures until satisfied of the excellence of the type.

Up to this time there has been no pressure for seacoast carriages, for the reason that we had not the modern guns to mount upon them. That, however, will no longer be the case, and the proof and construction of this class of carriages should proceed *pari passu* with the completion of guns.

The construction of carriages for field guns progresses favorably and satisfactorily.

SEACOAST MORTAR CARRIAGES.

Contracts have been entered into, as above stated, for seventy-three seacoast mortars, and the sum of $325,000 has been appropriated for the construction of carriages for the same.

The modern high-power breech-loading rifled mortar of about 12 calibers length of bore, being an entirely new arm in our service, carriages

of greater strength and endurance than any heretofore in use, capable of resisting the immense strain of firing a projectile of upward of 600 pounds weight at a great angle of elevation, had to be devised, constructed and tested.

Two types of carriages for these heavy rifled mortars, which are to constitute such an important part of our system of defense, have been purchased under allotments recommended by the Board, and both are now at Sandy Hook, one, the "Spring Return Carriage" undergoing, and the other, the "Canet Hydro-Pneumatic Carriage," awaiting test. While the former has not been entirely successful it has been so to a certain degree, and as it was the only carriage for heavy mortars which had been tested so far, and as the demand for such carriages was becoming urgent, it was thought that the defects developed, being simply of construction and not inherent in the design, the Board was justified in consenting to the request of the Chief of Ordnance and recommending the allotment of $100,000 for the construction of mortar carriages of this type. Accordingly, in February of this year such action was taken, the Board stating that it did not feel at liberty to recommend a larger allotment in view of the information then before it.

It is estimated that the present appropriations will procure about twenty-five of these carriages, leaving forty-eight mortars now under contract to be provided with carriages by future appropriations.

The devising of the best possible carriage for these high-power seacoast mortars is an inviting field for inventive genius, and a number of elaborate essays in this direction have come before the Board.

As either guns or mortars are useless without carriages adapted to their services, the time has arrived, in the judgment of the Board, for providing such carriages as rapidly as the guns and mortars shall be turned out, so that they may be at once placed in position.

GUN AND MORTAR BATTERIES.

By the fortification act of 1890, the expenditure of the appropriation of $1,221,000 for gun and mortar batteries at Boston, New York and San Francisco was placed under the supervision of this Board and on September 2, 1890, the same was allotted to the several objects in accordance with the project upon which the appropriation was based.

SUBMARINE MINES AND TORPEDOES.

Among the earliest objects of appropriation under the new policy of harbor defense, were submarine mines and torpedoes.

Following large appropriations previously made, the act of September 22, 1888, appropriated $250,000 for these and allied objects, and the further sum of $200,000 for the same objects was granted in the act of March 2, 1889. The expenditures under the acts above named were under the supervision of this Board.

Such liberal appropriations show the importance which the legislative branch of the Government attached to these methods of defense.

Recognizing the importance of these preparations, allotments were promptly made for the procurement of fixed torpedoes or submarine mines, and the Board approved the prosecution of continued and thorough experiments and tests to ascertain the most practicable and effective movable torpedo, controllable from the shore. These latter experiments as heretofore have been conducted at the Engineer Station at Willets Point, Long Island, under the direction and immediate super-

vision of the Engineer Department. Considerable progress has been made in these tests and the experiments are still continued.

Investigations looking to the development of a system for harbor defense by submarine mines were actually begun in 1869. In consequence of this, and of the much less time required for the construction of the material than of high-power guns and mortars and their mountings, the condition of the submarine mine defenses of our harbors is in a better state of forwardness than that of any of the other elements.

Of course it is not necessary that the mines shall be planted until the exigency shall arise; but a considerable supply of electrical operating apparatus, cases, anchors and small parts have been gradually accumulated; several shore stations have been constructed or are in process of construction, and all the more permanent parts of the system are kept in a state of readiness for use.

The manufacture of electrical cables and appliances has been immensely developed of late in this country, and it is believed that the necessity of placing large quantities of these perishable articles in store no longer exists. A supply sufficient to meet the first demand will suffice.

The principal harbors have been carefully studied, the position for each mine is indicated upon charts filed in the War Department, and a force of engineer officers and soldiers has been thoroughly trained in the loading, planting and connecting of these mines with the shore stations and in the operating of the system in war.

It is hardly necessary to say that submarine mines are not designed to constitute an independent system of defense. They form but one part of a combined system, the more important element of which consists in powerful shore batteries of high-power guns and mortars.

The mine fields are designed to delay hostile ships under fire until these heavy batteries can make their fire effective. Cable galleries connect the mines with the protracted shore stations and the electrical appliances designed for firing the mines, while the rapid-fire guns protect the mines from interference by the enemy, and also repel attacks upon the shore batteries or stations. Without the heavy batteries of high-power guns and mortars these appliances would be of no great value, as they could be removed or countermined by the enemy.

The Board calls attention to this feature of the case in order to emphasize the fact that the earliest production of an adequate number of modern high-power guns and mortars is the central and an all important element in the defense of our great seaports. Until this is accomplished all other preparations are insufficient and ineffective.

The movable torpedo under control from shore stations is an offensive weapon the powers of which are not yet fully developed. It is of limited range, of uncertain accuracy, and of so complex mechanism as to be liable to frequent failures. Its true function is the defense of mine fields; and for this purpose it appears worthy of the development, bearing in mind, however, that it can never constitute more than an auxiliary defense.

ERICSSON AËRIAL SUBAQUATIC PROJECTILE.

Among other subjects which have engaged the attention of the Board is the Ericsson aërial subaquatic projectile. This is an invention owned by the Ericsson Coast Defense Company and is attributed to the distinguished inventor John Ericsson, the designer of the original *Monitor*. The claim made for this device is that it can be fired from either a pneu-

matic gun or from a powder gun modified from one of our smoothbore 15-inch guns, and after a considerable aërial flight will on striking the water descend to a depth below the surface for which it may have been previously adjusted. Reaching such depth, it will without change of direction proceed on its course, the path pursued remaining straight and practically parallel to the surface of the water. Whether the company will be able to make the projectile accomplish what is claimed can of course be only determined by actual trial, and in view of the great advantages offered by this invention, if it should prove successful, the Board has recommended an allotment of $11,333.33 for the purchase of four of these projectiles.

They have been delivered and are awaiting the receipt of one of the pneumatic guns now under contract, with which they will be tested.

RAPID-FIRE GUNS.

A matter which has engaged the attention of the Board to a considerable extent for some time past has been the investigations necessarily preliminary to the determination of the proper type of gun for the protection of the mine areas or torpedo fields arranged for obstructing the channels of approach to our harbors and for flanking the shore batteries. Such a gun must be of the rapid-fire type, and its ammunition should belong to the smokeless variety. These conditions being adopted as essential, the Board, after careful study of the necessities of the case and a comparison of the merits and demerits of the various systems and calibers adopted throughout the world, recommended in May last that the Canet, the Armstrong, and the Hotchkiss types of rapid-fire gun be tested. Of the guns ordered—and which, it is hoped, will be delivered in a few months—each is mounted upon the carriage which the manufacturer deems best suited to develop its capabilities. All three are of the same caliber, namely, 4.72 inches, and each employs smokeless powder. Ammunition to the amount of five hundred rounds for each gun has also been ordered. It is proposed to submit these guns to a thorough test with a view to determining which is best suited for the purpose required.

The Board has also made an allotment for a Driggs-Schroeder 6-pounder rapid-fire gun, which is now in the hands of the Ordnance Department for test.

Attention has also been given to several types of breech mechanism intended to facilitate rapidity of fire. The Gerdom and Seabury systems are now being experimentally applied, respectively, to the field (3.2-inch) and siege rifle (5-inch) gun, while still other systems are yet under consideration by the Board.

HIGH EXPLOSIVES.

A subject that has engaged much of the attention of the Board is that of explosives, and especially of high explosives and projectiles for their use. Numerous varieties have been brought to the attention of the Board and have received its careful consideration.

A committee of the Board, consisting of Gen. Abbot and Col. Mordecai, has been charged with a series of investigations and experiments to determine what form of high explosive and what method of charging the projectile are best adapted to the exigencies of coast defense. The trials were conducted by the Ordnance Department. Attention is invited to the appended reports from this committee (Appendix E), one,

dated June 5, 1889, submitting the general programme which was adopted by the Board, and the other, dated October 12, 1891 (which also meets with the approval of the Board), reporting progress to date, with the conclusions resulting therefrom, together with a programme for the further prosecution of the trials in the early future.

It is too early to say that a conclusion has been reached; but the Board hopes that the problem may be solved of firing a shell charged with a satisfactory high explosive of sufficient destructive energy from an ordinary rifled gun without danger of premature explosion. Such a problem is one to command the best attention of scientific military men and of inventors.

In this connection attention is called to the fact that large appropriations have been made for pneumatic dynamite guns. Should the result above indicated be reached, the pneumatic gun would be superseded, as the shortness of its range will cause it to remain under the fire of the enemy's long-range high-power rifles until the hostile ship elects to come within its sphere of action.

PROJECTILES.

By the acts of 1890 and 1891 there was appropriated $63,000, mostly for cast-iron projectiles, the greater part being for experimental firing with seacoast high-power guns and mortars and shell for testing explosives; $40,000 for steel shell for seacoast guns, and $200,000 for steel armor-piercing projectiles. These appropriations were promptly allotted by the Board.

The armor-piercing projectiles are in part for experimenting with the high-power seacoast guns and partly for permanent supply.

These armor-piercing projectiles are made with the same care and subject to the same inspections as the guns themselves, since the destructiveness of the fire must depend upon the excellence of the projectile. They are made from forged steel, tempered and annealed. For the larger calibers a piece cut from every shot is subjected to thorough tests in the testing machine, and, after completion, samples are put to the most searching ballistic tests by firing against armor plate one and one eighth times the caliber of the projectile in thickness. Elaborate regulations satisfactory to the Board for the inspections and tests of the steel, as well as for the completed projectile, have been prescribed by the Ordnance Department.

It is estimated that the appropriation now available will procure two hundred and twenty 8-inch, two hundred and twenty 10-inch, and two hundred 12-inch projectiles. These are now under contract with the Midvale Steel Company, of Philadelphia.

No projectiles have yet been manufactured under this contract.

BREECH-CLOSING DEVICES.

Among other breech-closing devices the Board has given careful consideration to that invented by Col. Theodore Yates, U. S. Army (retired). This device Col. Yates claims is equally applicable to heavy or to light guns. It has been the intention of the Board to purchase a sample mechanism of this kind from Col. Yates and have it applied to the standard field gun, but no gun suited to receive it being available, such action has not yet been taken.

For this purpose an allotment was made May 2, 1890, of $250.

ARTILLERY SIGHTS.

The subject of artillery sights has also received attention at the hands of the Board, and three sights designed by officers of our artillery service (Capt. Zalinski and Lieuts. Best and Carbaugh) are already either completed and undergoing test or are in process of construction, under allotments recommended by the Board. Allotments have also been recommended for the procurement from abroad of the Scott and the Grenfel sights, and the Bode Quadrant Sight for trial.

RANGE AND POSITION FINDERS.

The increased range of modern guns and the increased cost of artillery ammunition, which naturally restricts peace practice, have directed attention of late to various optical and mechanical devices for determining the location of a distant object. These instruments all proceed upon the well-known principle of determining the elements of a triangle, at the vertex of which is the object, while the base of known length and the two base angles are within the reach of the operator. These three elements of the triangle being ascertained, the distance and direction of the object from the gun can be determined. In some instruments the base line is horizontal; in others it is vertical, and is the elevation of the instrument above the surface of the water. The distance may be made known by electrical indicators, or by converging radial arms moving over a map of the harbor approaches. The various military powers of Europe have systems of range finding for use in their harbors, the details of which are preserved with the greatest secrecy. In this country invention in the same direction has been stimulated by reports of what has been done abroad, and, as the consequence, this Board has had before it so many inventions of this kind that it has been compelled to ask for the appointment of a distinct range finder board to act under it in the test of such completed instruments as may be ordered by this Board.

The subject is as yet far from being exhausted, and the Board is not prepared to make any recommendation looking to the definite adoption of any system. But completed instruments of the Fiske, Ruckman-Crosby, Berdan, and Lewis types have been purchased, and, with the exception of the last named, have been tested by the range finder board. The reports of that board, showing what defects have been found in the instruments, have been referred to the inventors in the hope that they may be able to obviate them. The Lewis instrument is now being prepared for test at Fort Wadsworth, New York Harbor.

The Board has also made an allotment for the purchase of a portion of a novel position finding instrument invented by Henry Hess, which will test the fundamental principle of its construction. This portion, it is thought, will determine the availability of his system.

The Board is still in correspondence with several other inventors who are hopeful of arriving at the successful solution of this important problem.

SÉBERT VELOCIMETER.

Among the matters for which the Board has made allotment is the Sébert Velocimeter, an instrument used for measuring velocities in the bore of a piece, and at any point beyond the muzzle. This gives valuable and much-needed information for use in determining the various

factors entering into the intricate problem of gun construction and the preparation of suitable powders. The instrument is now in use at the Proving Ground at Sandy Hook.

AMMUNITION WAGON.

A question which has for many years engaged the attention of military men in all countries has been that of furnishing an adequate supply of ammunition to the fighting line. Many devices have been proposed for this purpose, but of those which the Board has had before it all have been considered impracticable except that of Lieut. Kimball of the Navy. To enable a test to be made the Board recommended that one be purchased at a cost of $600. It has been sent to the Infantry and Cavalry School at Fort Leavenworth for trial.

FUSES.

The number of fuses which have been submitted to the Board is very small in proportion to the number of other inventions. So far only three have been presented whose promise of successful results was sufficient to justify the Board in making allotments to procure samples. Of these two are American, namely, the Merriam base percussion fuse, for which allotment was first made on November 4, 1890; and the Berdan mechanical distance fuse, which the Board decided on December 12, 1890, to test, and for which it has since made several allotments of small amounts to continue the experiments. The foreign fuse is French, being made by the Ar. Walter Company of France. Allotment of $150 was made on June 6, 1891, to procure fifty of these fuses.

None of the tests of these fuses has yet proceeded sufficiently far to justify a definite opinion upon their merits.

SITE FOR AN ORDNANCE PROVING GROUND.

Among other duties imposed upon the Board by Congress was that of making an examination of "a site or sites for ordnance testing and proving ground to be used in the testing and proving of heavy ordnance, having in view in the selection of said site or sites their accessibility by land and water, means of transportation, and suitability for the purpose intended, and also the actual and reasonable cost, and the value of the land embraced in said site or sites, and the least sum for which the same can be procured." The result of the examination into this subject by the Board has already been submitted to Congress and has been printed in House Ex. Doc. 148, Fifty-first Congress, first session, a copy of which is hereto appended, marked F.

GENERAL AND SPECIAL DUTIES OF THE BOARD.

The Board has thus briefly presented a report of its "general operations from the beginning of the operations of the Board" until the date of making this report.

The practical operation of the Board may be stated, by way of illustration, as follows:

Such appropriations as are made by Congress upon estimates and projects furnished by the Chief of Engineers and the Chief of Ordnance subject to the supervision of the Board are communicated to it through the Secretary of War, with requests for such allotments for specific objects as are considered essential from time to time.

The Board investigates the subject-matter, calls for such information as it may need, and after full information and consideration the allotment is recommended of such amount as the Board is satisfied should be made. This recommendation goes to the Secretary of War for his approval.

Or, a communication is received from the inventor of a gun, projectile, carriage or other device or engine of war, either directly or by reference of the Secretary of War. The communication is taken up by the Board, considered, further information asked, drawings and specifications required, and after careful investigation it is decided whether the invention is worthy of trial or not. If the decision is favorable, recommendation is made for the purchase or manufacture of a sample of the invention or device, which recommendation is submitted to the Secretary of War for his approval.

In addition to the general duties of the Board, others of a special nature have been imposed upon it by special provisions of law from time to time. Such were the prescribing of tests and the testing of the 12 inch cast-iron mortar; the prescribing of tests and testing of 10 or 12-inch steel guns, to be presented for test and purchase under section 6 of the act of September 22, 1888; the examination of sites for an ordnance proving ground, under the Army appropriation act of 1889; the prescribing of conditions and tests, and adjudging upon the purchase of one hundred guns by contract, under the acts of 1890 and 1891; the making of "all needful and proper purchases, experiments and tests to ascertain, with a view to their utilization by the Government, the most effective guns, small arms, cartridges, projectiles, fuses, explosives, torpedoes, armor plates and other implements and engines of war, and to purchase or cause to be manufactured, under the authority of the Secretary of War, such guns, carriages, armor plates and other war materials and articles as may, in the judgment of the Board, be necessary in the proper discharge of the duty devolved upon it by the act approved September 22, 1888," as required by the act of February 24, 1891

The extent and complexity of the work may be judged from the following summary:

The Board held its first sessionOctober 30, 1888, and during the three years to October 30, 1891, has held thirty-one regular sessions averaging over four days to each session, or about one hundred and twenty-seven working days in all. It has made reports of each session, in the form of a journal, to the Secretary of War, and these reports, with extracts furnished to private persons and others, and other reports made by the Board, occupy over 1,700 typewritten pages of record.

The Board has examined and acted upon over 350 inventions of various kinds. These include guns and improvements in the same, mortars, high explosives; and guns, shells and systems for firing high explosives; small arms, machine and rapid-firing guns, batteries, gun carriages, shells and other projectiles, metals for gun construction, range and position finders, plans for coast defense, and movable torpedoes, sights, powders, breech mechanisms for guns, air-ships or balloons, cartridges, defensive and ammunition wagons, electric arms, and other appliances of electricity in warfare, fuses, defensive shields, land locomotive, optical devices, target, ammunition hoist, surveying compass, and war rocket. The consideration of these inventions and other business has required the examination of fully 2,500 papers, including over 300 drawings. Each inventor or person interested has been promptly informed of the action finally taken upon his invention, and about 60 hear-

ings of inventors and others were had before the Board in explanation of matters under consideration, the record of which, made by the stenographer of the Board, contains over 1,600 folios.

SUMMARY.

When Congress resumed measures for the defense of the coast there was no place in the United States where forgings for 10 and 12-inch steel guns could be produced, and no factory where they could be finished and assembled either by private parties or under the control of the War Department.

There are now certainly two great plants where forgings up to 12-inch guns can be turned out with reasonable dispatch, and a gun factory where they can be finished and assembled. Types of 8, 10 and 12-inch guns have been completed and either tested or are awaiting proof. It is expected that by January 1, 1892, the factory will have turned out nine 8-inch, five 10-inch and two 12-inch guns. Eleven guns of 8-inch caliber are under contract with the West Point Foundry; one hundred guns of 8, 10 and 12-inch caliber are practically under contract with the Bethlehem Iron Company; seventy-three 12-inch seacoast mortars are under contract or completed. Types of gun and mortar carriages have been procured and are undergoing tests; considerable success has attended the efforts to produce an American slow-burning prismatic powder that shall render the United States independent of foreign manufacturers; a beginning has been made on the construction of gun and mortar batteries for the protection of our most important ports; while general advance has been made along the whole line of defensive preparation. Four years continuance of similar legislation and activity, and it can no longer be said that the United States are defenseless against foreign powers.

It is to be hoped that these defensive preparations may never be required in actual warfare. That they are *made* is the best possible guaranty that they will not be called into hostile use.

J. M. SCHOFIELD,
Major-General, U. S. Army, President of the Board.
HENRY L. ABBOT,
Colonel, Corps of Engineers,
Brevet Brig. Gen., U. S. Army.
HENRY W. CLOSSON,
Colonel, Fourth Artillery.
A. MORDECAI,
Colonel, Ordnance Department, U. S. Army.
BYRON M. CUTCHEON,
Civilian Member.

D. M. TAYLOR,
Captain, Ordnance Department, Recorder of the Board.

FOR FIRST ANNUAL REPORT TO CONGRESS MADE BY THE BOARD OF ORDNANCE AND FORTIFICATION.

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Appendix A.

Appropriations made for the objects specified to be expended under the direct supervision of the Board.

Under the act approved Sept. 22, 1888.	Appropriated.	Allotments.		Remarks.
		Date.	Amount.	
SEC. 2. For the protection, preservation, and repair of fortifications and other works of defense.	$100,000.00	Oct. 30, 1888.	$100,000.00	
For the construction of sea walls, and for earth embankments	117,000.00	....do	117,000.00	
For torpedoes for harbor defense; the purchase of submarine mines and necessary appliances to operate them; for needful casemates, cable galleries, and appliances to render it possible to operate submarine mines; for continuing torpedo experiments; for practical instruction of engineer troops in detail of the service, and for the purchase of movable submarine torpedoes controlled at will by power transmitted from shore stations.	200,000.00	....do	200,000.00	
SEC. 3. For the completion of the guns now under fabrication by the Ordnance Department and for testing the same, and for the manufacture or purchase and test of cannon and carriages, including carriages manœuvred by power, one of which shall be a disappearing carriage, and also including those for the field and siege services; for the alteration of carriages on hand to adapt them to improved service guns; for projectiles, powders, fuzes, and implements, their trial and proof; for experiments in the means of protecting torpedo lines; for compensation of draftsmen while employed in the Army Ordnance Bureau on ordnance construction, and for the necessary expenses of ordnance officers while temporarily employed at the proving ground and absent from their proper stations, at the rate of two dollars and fifty cents per diem while so employed.	500,000.00	Oct. 30, 1888, to Sept. 22, 1891.	497,065.41	Balance $2,934.59.
For examining, testing, and experimenting with pneumatic or other dynamite guns, gun carriages, aërial torpedoes, dynamite shells and ammunition, and batteries for coast defense, whether sunken counterpoise, or otherwise, brought to the notice of said Board.	100,000.00	Nov. 10, 1888, to Feb. 13, 1891.	48,393.33	Balance $51,606.67.
Provided, That all material purchased under this section, excepting samples, shall be of American manufacture.				
SEC. 4. For the erection, purchase, or manufacture of the necessary buildings and other structures, machinery, tools, and fixtures for an army gun factory for finishing and assembling heavy ordnance, to be erected at the Watervliet Arsenal, West Troy, New York.	700,000.00	Nov. 6, 1888, to Nov. 8, 1888.	700,000.00	
Provided, That not exceeding twenty thousand dollars of this sum may be used for the erection and completion of two sets of officer's quarters.				
For the purchase of rough-finished, oil-tempered, and annealed steel for high-power coast-defense guns of eight, ten, and twelve inch caliber, in quality and dimensions conforming to specifications, subject to inspection at each stage of the manufacture, and including all the parts of each caliber.	1,500,000.00	Nov. 6, 1888	1,500,000.00	
Provided, That no money shall be expended except for steel accepted and delivered, and no contract shall be made hereunder for gun steel at a greater average price per pound for each caliber than the lowest average price paid under contracts hitherto made by the Government for American forgings of like caliber.				

Appropriations made for the objects specified to be expended under the direct supervision of the Board—Continued.

Under the act approved Sept. 22, 1888.	Appropriated.	Allotments.		Remarks.
		Date.	Amount.	
SEC. 5. For the purchase of the material for, and the manufacture of, twelve-inch breech-loading rifled mortars of cast iron, hooped with steel, of about thirty-two thousand pounds weight, similar to, and equal in range, power, and accuracy of fire to the twelve-inch breech-loading mortar, cast iron, steel-hooped, now at the ordnance proving ground, Sandy Hook, New Jersey, said mortars to be subject to inspection in all stages of manufacture.	$250,000.00	Nov. 6, 1888	$250,000.00	
SEC. 6. The Board is authorized to make all needful and proper purchases, investigations, experiments, and tests to ascertain, with a view to their utilization by the Government, the most effective guns, including multicharge guns and the conversion of Parrott and other guns on hand, small arms, cartridges, projectiles, fuzes, explosives, torpedoes, armor-plates, and other implements and engines of war; and the Secretary of War is hereby authorized to purchase or cause to be manufactured, such guns, carriages, armor-plates, and other war materials and articles as may, in the judgment of said Board, be necessary in the proper discharge of the duty herein devolved upon them: *Provided*, That the amount expended and liabilities incurred in such purchases, investigations, experiments, and tests shall not exceed five hundred thousand dollars, which sum is hereby appropriated: *Provided further*, That said Board shall test, and if found satisfactory, shall purchase two breach-loading field guns of three and two-tenths inch bore of aluminum bronze.	500,000.00	Oct. 31, 1888, to Sept. 22, 1891.	481,847.02	Balance $18,152.98.
For payment of the necessary expenses of the Board, including a per diem allowance to each member thereof when employed on duty away from his permanent station, of two and one-half dollars a day.	5,000.00	Expended to Aug. 15, 1891	5,000.00	
Total	3,972,000.00		3,899,245.76	Balance $72,754.24.
Under the act approved Mar. 2, 1889.				
Under the act making *appropriations for the support of the Army* for the fiscal year ending June thirtieth, eighteen hundred and ninety, and for other purposes, approved March 2, 1889, were appropriated the following:				
To enable the Secretary of War to cause examinations and tests to be made in converting the existing cast-iron ordnance of the War Department into steel-lined breech-loading torpedo howitzers for throwing high explosives, according to the plans heretofore submitted to Congress and to be submitted to the Board of Ordnance and Fortification.	15,000.00			This appropriation was annual and lapsed with the fiscal year.
The Board of Ordnance and Fortification is hereby directed to examine and report upon a site or sites for ordnance testing and proving ground to be used in the testing and proving of heavy ordnance, having in view in the selection of said site or sites their accessibility by land and water, means of transportation, and suitability for the purpose intended, and also the actual and reasonable cost, and value of the land embraced in said site or sites and the least sum for which the same can be procured. Said Board shall report thereon to the Secretary of War, to be submitted to Congress at its next session; and in case the said Board shall select a site or sites and recommend their purchase, the Secretary of War is hereby authorized to secure written proposals for the sale of the land so recommended, until such time as Congress may act upon the recommendation of said Board and of the Secretary of War.				

For the necessary expenses under the foregoing provision	1,000.00		556.20	Balance $443.80 turned into the Treasury.
For the construction of a counterpoise battery to mount a seacoast rifled gun. Said battery to be located at such point as the Board of Ordnance and Fortification may direct: The erection of such battery shall be by the inventor thereof under the general direction of the Board of Ordnance and Fortification and shall be completed within twelve months from the time this act shall take effect, and the gun to be mounted thereon with its fittings shall be furnished by the Ordnance Department of the Navy.	40,000.00	June 12, 1889, to Feb. 18, 1890.	2,600.00	Balance not expended, $37,400. This appropriation was continued by Fortification act, approved August 18, 1890, for that fiscal year only, and has lapsed.
Total	56,000.00		3,156.20	All allotments under this act have been expended or covered into the Treasury.
Under the act approved Mar. 2, 1889.				
Under the act approved March 2, 1889, *making appropriations for fortifications and other works of defense*, for the armament thereof, for the procurement of heavy ordnance for trial and service, and for other purposes, were appropriated the following:				
Preservation and repair of fortifications: For the protection, preservation, and repair of fortifications.	100,000.00	June 13, 1889	100,000.00	
For preparation of plans for fortifications	5,000.00	Oct. 21, 1891	5,000.00	
Torpedoes for harbor defense: For the purchase of submarine mines and necessary appliances to operate them for closing the channels leading to our principal seaports.	250,000.00	June 13, 1889	250,000.00	
For needful casemates and cable galleries to render it possible to operate submarine mines.	250,000.00	....do	250,000.00	
For continuing torpedo experiments and for practical instruction of engineer troops in the details of the service.	30,000.00	....do	30,000.00	
For the purchase of movable submarine torpedoes, in the discretion of the Board on Ordnance and Fortification.	50,000.00	May 3, 1890	25,225.00	$247,775 unallotted.
For torpedo shed at San Francisco Harbor	22,000.00	June 13, 1889	22,000.00	
Armament of fortifications: For the finishing and assembling of eight-inch, ten-inch, and twelve-inch steel guns made from forgings procured under the act of September twenty-second, eighteen hundred and eighty-eight.	35,000.00	May 2, 1890	35,000.00	
For the purchase of steel forgings for field and siege cannon, as follows:				
For steel forgings for not less than twenty-four three and six-tenths inch field guns.	24,000.00	.....	.....	$24,000 unallotted.
For steel forgings for not less than ten five-inch siege guns	20,000.00	May 2, 1890	20,000.00	
For steel forgings for not less than ten seven-inch siege howitzers	18,000.00	Oct. 1, 1890	18,000.00	
For steel forgings for not less than sixteen three and six-tenths inch field mortars	2,000.00	Mar. 26, 1891	2,000.00	
For manufacture of field and siege cannon (finishing and assembling) within the fiscal year eighteen hundred and ninety.	14,000.00	.....	.....	$14,000 unallotted. This amount was reappropriated under the act of 1890.
For the test of experimental guns procured under the act of September twenty-second, eighteen hundred and eighty-eight, namely:				
For one ten-inch wire-wound gun, steel	28,000.00	June 11, 1889	28,000.00	
For one twelve-inch gun, steel hooped	39,500.00	....do	39,500.00	
For procuring one ten-inch disappearing gun carriage	13,500.00	May 6, 1891	13,500.00	This sum was allotted May 6, 1891, from the act approved Feb. 24, 1891, which reappropriated it from act of March 2, 1889, in addition to the $56,500 in said act of Feb. 24, 1891.
For gun platforms at proving ground	6,500.00	June 11, 1889	6,500.00	
For projectiles for field, siege, and seacoast guns for issue to the service	28,500.00	....do	28,500.00	
For siege-gun powder for issue to the service	7,000.00	....do	7,000.00	
For fuzes and implements for issue to the service	2,000.00	....do	2,000.00	

Appropriations made for the objects specified to be expended under the direct supervision of the Board—Continued.

Under the act approved Mar. 2, 1889.	Appropriated.	Allotments.		Remarks.
		Date.	Amount.	
For the alteration of barbette carriages for ten-inch smoothbore guns to adapt them to the service of eight-inch muzzle-loading converted rifles.	$54,000.00	June 11, 1889	$54,000.00	
For the alteration of barbette carriages for fifteen-inch smoothbore guns to adapt them to present service conditions.	46,000.00	....do	46,000.00	
For the manufacture of carriages for twelve-inch breech-loading rifled mortars, procured under the act of September twenty-second, eighteen hundred and eighty-eight.	100,000.00	Feb. 13, 1891	100,000.00	
For the manufacture of forty caissons and ten combined battery wagons and forges for three and two-tenths inch field guns.	43,274.00	June 12, 1889	43,274.00	
For procuring the necessary instruments and other materials and for the proper installation of instruments for conducting the annual heavy artillery practice of the Army.	20,000.00	....do	20,000.00	
For repairs and improvements at the ordnance proving ground, Sandy Hook, New Jersey, namely:				
Repairing dock and dredging $5,500.00				
Relaying roads and walks 3,800.00				
Repairs to officers' quarters 2,000.00				
Repairs to foreman's and soldiers' quarters 2,600.00				
Repairs to office 500.00				
Repairs to shops and storehouses 1,000.00				
Machinery for shops 4,000.00				
Clearing ground about ranges 600.00				
Laying narrow-gauge tramway to proof butts and targets 5,320.00				
	25,320.00	....do	25,320.00	
Provided, That all material purchased under this act shall be of American manufacture.				
Total	1,233,594.00	.....	1,170,819.00	Balance $62,775 unallotted.
Under the act approved Aug. 18, 1890.				
Under the act approved August 18, 1890, *making appropriations for fortifications and other works of defense*, for the armament thereof, for the procurement of heavy ordnance for trial and service, and for other purposes, were appropriated the following sums: To be expended under the direct supervision of the Board of Ordnance and Fortification, created by the fortification appropriation act approved September twenty-second, eighteen hundred and eighty-eight, and in the manner prescribed by said act, namely:				
Gun and mortar batteries: For construction of gun and mortar batteries for defense of Boston Harbor.	235,000.00	Sept. 2, 1890	235,000.00	
New York	726,000.00	....do	726,000.00	
San Francisco	260,000.00	....do	260,000.00	
For the procurement of land, or right pertaining thereto, needed for the site, location, construction or prosecution of works, for fortifications and coast defenses.	500,000.00	Oct. 24, 1891	500,000.00	
Armament of fortifications: For the manufacture (finishing and assembling) of eight-inch, ten-inch, and twelve-inch steel seacoast guns from forgings procured under fortification act of September twenty-second, eighteen hundred and eighty-eight.	70,000.00	May 6, 1891	70,000.00	

For completing the manufacture (finishing and assembling) of three and six-tenths-inch, five-inch, and seven-inch steel field and siege cannon from forgings procured under fortification act of March second, eighteen hundred and eighty-nine. Together with the unexpended balance of the appropriation of fourteen thousand dollars made for this object by the fortification appropriation act approved March second, eighteen hundred and eighty-nine.	36,000.00	Mar.	26, 1891	31,000.00	Balance $5,000 unallotted.
That contracts shall be invited by the Secretary of War by proper notice and publication for the manufacture (finishing and assembling) of eight-inch, ten-inch, and twelve-inch steel seacoast guns from forgings procured under fortification act of September twenty-second, eighteen hundred and eighty-eight, and if private parties shall offer to finish, assemble, and deliver any of such guns in proper condition for use as completed guns, at a price fair to the Government, the necessary contracts shall be entered into by the Secretary for that purpose, and to carry into effect this provision. *Provided*, That the finishing and assembling of not over fifty per centum of each caliber of such forgings shall be thus contracted for: *Provided further*, That all contracts made hereunder shall be so made as to fully protect the Government against all loss or damage which may result from imperfect work, the fault of the contractor, and the work done hereunder shall be subject to inspection at every stage.	200,000.00	Oct. Nov.	1, 1890 8, 1890	500.00 65,000.00	Drawings, etc., $134,500 unallotted.
For steel field guns of three and two-tenths inch caliber	25,000.00	Sept.	2, 1890	25,000.00	
For breech-loading rifled seacoast mortars, cast iron, hooped with steel, of twelve-inch caliber. *Provided*, That contracts may be made for not more than one-fourth of the mortars herein provided for, to be constructed on the Pacific coast in the discretion of the Secretory of War.	400,000.00	....do		400,000.00	
For sights and implements for guns and for fuses	2,000.00	....do		2,000.00	
For metallic carriages for field-gun batteries	143,135.00	Sept.	2, 1890	143,135.00	
For alteration of existing carriages for ten-inch and fifteen-inch smoothbore guns to adapt them to present service conditions.	100,000.00	....do		100,000.00	
For carriages for breech-loading rifled mortars of 12-inch caliber, procured under the fortification act of September twenty-second, eighteen hundred and eighty-eight.	225,000.00				$225,000 unallotted.
For powder for proving seacoast mortars of twelve-inch caliber, procured under the fortification act of September twenty-second, eighteen hundred and eighty-eight, and for testing projectiles.	10,000.00	Sept.	2, 1890	10,000.00	
For steel shell or shrapnel for field guns	12,000.00				$12,000 unallotted.
For cast-iron projectiles for field, siege, and seacoast guns, for issues to the service	24,500.00	Sept.	2, 1890	24,500.00	
For cast-iron projectiles for proving seacoast mortars of twelve-inch caliber, procured under the fortification act of September twenty-second, eighteen hundred and eighty-eight.	10,000.00	....do		10,000.00	
For steel shell for seacoast cannon	25,000.00	Sept.	3, 1890	25,000.00	
For steel armor-piercing projectiles for seacoast guns	100,000.00	Sept.	2, 1890	100,000.00	
For purchase and erection of armor plate for testing armor-piercing projectiles	24,000.00	Nov.	6, 1890	24,000.00	
Army Gun Factory: For machinery and plant for the manufacture of steel shell or shrapnel for field guns.	5,000.00				$5,000 unallotted.
For machinery to complete the full capacity of present Gun Factory building at Watervliet Arsenal, West Troy, New York.	165,000.00	Sept.	2, 1890	165,000.00	
For construction of a building for wash rooms, closets, and sinks for the operatives of the Gun Factory.	12,000.00	Sept. Oct.	5, 1890 1, 1890	10,630.00 1,370.00	
For increase of machinery and plant for manufacture of projectiles, and for castings needed in current work of gun fabrication at Army Gun Factory.	16,000.00	Oct.	1, 1890	16,000.00	
For erection and completion of a fire-proof brick office building for the Army Gun Factory, Watervliet Arsenal, New York.	23,000.00	Oct.	4, 1890	23,000.00	The allotment of Oct. 4, 1890, was not approved until Sept. 3, 1891.

Appropriations made for the objects specified to be expended under the direct supervision of the Board—Continued.

Under the act approved Aug. 18, 1890.	Appropriated.	Allotments.		Remarks.
		Date.	Amount.	
For railroad sidings, switches, and weighing scale at the Army Gun Factory, Watervliet Arsenal, New York.	$2,800.00	Sept. 2, 1890	$2,800.00	
For one hundred and fifty horse power steam engine and shafting for machine shop at the Army Gun Factory, Watervliet Arsenal, New York.	3,500.00	....do	3,500.00	
For boring and turning lathes, rifling machine, and eighty-ton traveling-crane fully equipped for the manufacture of twelve-inch guns, at Watervliet Arsenal, New York.	320,000.00	....do	320,000.00	
That all material purchased under the foregoing provisions of this act shall be of American manufacture.				
That the President is hereby authorized to appoint a board to consist of three officers of the Army, one of engineers, one of artillery, and one of ordnance, not below the rank of lieutenant-colonel, who shall inquire into the facilities for producing steel forgings for high-power guns at or near the Pacific coast; and in the vicinity of the Rock Island Arsenal, and in the vicinity of the Indianapolis Arsenal, and at some point on or near the Gulf coast, and the advisability of erecting gun factories for finishing and assembling high-power guns, to be mounted in fortifications, at the Benicia Arsenal, in California, or at the Rock Island Arsenal, or at the Indianapolis Arsenal, or at some point on or near the Gulf coast.				
Said board shall also examine and report as to the capacity, cost of erection, and equipment of each of such gun factories.				
For the payment of the necessary expenses of said board	3,000.00	Oct. 1, 1890	3,000.00	
Board of Ordnance and Fortification: To enable the Board of Ordnance and Fortification to purchase abroad, for experimental purposes, such articles of foreign manufacture as are not produced in this country, and which are necessary in order that the Board may determine what may be best and worthy of adoption and manufacture in the United States.	100,000.00	.....	.....	$100,000 unallotted.
For the necessary expenses of the Board, as provided for in the last clause of section six of the act approved September twenty-second, eighteen hundred and eighty-eight.	5,000.00	Expended to Oct. 30, 1891.	567.50	4,432.50 unexpended.
To enable the necessary experiments to be made to test the value thereof, including the purchase of material and construction where necessary, of pneumatic gun carriages, segmental guns, and high explosives.	50,000.00	May 6, 1891 July 21, 1891 Oct. 24, 1891	3,031.00 125.00 18,912.50	27,931.50 unallotted.
SEC. 2. That the Secretary of War is hereby authorized and directed to purchase under contract, after due advertisement inviting proposals, and at prices which the Board of Ordnance and Fortification shall adjudge to be fair to the manufacturer and for the interest of the United States, twenty-five eight-inch, fifty ten-inch, and twenty-five twelve-inch guns, all of which guns shall be breech-loading single-charge steel guns, and of weight and dimensions to be prescribed by the Board, and shall fulfill the conditions hereinafter provided: *Provided*, That if two or more persons, citizens of the United States, submit proposals to furnish said guns, either in part or in whole, at prices not materially different from each other, contracts may be awarded, in such proportion, among the citizens submitting such proposals as the Secretary of War may direct. One type gun of each of the above-mentioned caliber, with the proper supply of ammunition therefor, shall be presented for test at such place and within such time as the contract shall provide, and shall be subjected to such tests in respect to accuracy, range, power, endurance, and general efficiency as the Board of Ordnance and Fortifica				

gun shall have prescribed. All the other guns of each caliber, with the proper supply of ammunition, shall be delivered at such place and within such times as the contract shall provide, and shall be subjected to the ordinary service test of ten rounds with the full charge and weight of projectile, which shall develop the standard power prescribed for the gun. If the type gun sustains the prescribed test to the satisfaction of the Board of Ordnance and Fortification, it and each of the other guns which sustains the ordinary service test, and the ammunition expended in such tests, shall be accepted under the contract. All guns manufactured under these contracts, including the type guns, shall be subjected to inspection at all stages of manufacture, and no change whatever shall be made in the material, mode of manufacture, or dimensions of the guns for service from those employed in the type gun without the approval of the Secretary of War. Payment for each gun and ammunition for testing same, including cost of transportation, shall be made upon the satisfactory completion of the prescribed test for that gun. All tests of guns shall be made in the presence of the Board and of the person presenting the gun, or his authorized agent, and due regard shall be paid to suggestions offered by him which respect the mode of making such test.

That under the provisions of this section there shall not be expended or contract or contracts entered into involving the Government in an aggregate expenditure exceeding three million seven hundred and seventy-five thousand dollars, nor an expenditure on the part of the Government in any one fiscal year in excess of one million dollars. And all guns and materials purchased under the authority of this section shall be of American manufacture and furnished by citizens of the United States: *Provided further*, That contracts may be made for not exceeding one-fourth of the guns herein provided for, to be constructed on the Pacific coast, in the discretion of the Secretary of War: *Provided further*, That all expenditures made under this section shall be paid from the amount made available and provided for in section six of the "Act making appropriations for fortifications and other works of defense, for the armament thereof, for the procurement of heavy ordnance for trial and service, and for other purposes," approved September twenty-second, eighteen hundred and eighty-eight, and the Secretary of War shall embrace in his estimates of appropriations for fortifications from time to time the amounts necessary to carry out all contracts made hereunder: *Provided further*, That full and accurate accounts shall be kept, showing the cost of all type and experimental manufacture of guns, and other articles, and the average cost of the several classes of guns and the other articles manufactured by the Government a statement of which account shall be laid before Congress annually in the same manner as is now required from national armories under section sixteen hundred and sixty-five of the Revised Statutes.

Total	3,832,935.00		3,319,071.00	**Balance, $513,864.**

Under the act approved Feb. 24, 1891.

Under the act approved February 24, 1891, *making appropriations for fortifications and other works of defense*, for the armament thereof, for the procurement of heavy ordnance for trial and service, and for other purposes, were appropriated the following sums, to be expended under the direct supervision of the Board of Ordnance and Fortification, created by the fortification appropriation act, approved September twenty-second, eighteen hundred and eighty-eight, and in the manner prescribed by said act, namely:

Armament of fortifications: For the manufacture (finishing and assembling) of eight-inch, ten-inch, and twelve-inch steel seacoast guns from forgings procured under fortification act of September twenty-second, eighteen hundred and eighty-eight.	70,000.00	Mar. 25, 1891	70,000.00	
For steel field guns of three and two tenths inch caliber	25,000.00	....do	25,000.00	
For metallic carriages for field-gun batteries	61,000.00	....do	61,000.00	

Appropriations made for the objects specified to be expended under the direct supervision of the Board—Continued.

Under the act approved Feb. 24, 1891.	Appropriated.	Allotments.		Remarks.
		Date.	Amount.	
For carriages for field mortars of three and six-tenths inch caliber	$5,760.00	Mar. 26, 1891	$5,760.00	
For carriages for siege rifles of five-inch caliber	30,000.00	Sept. 22, 1891	30,000	
For carriages for siege howitzers of seven-inch caliber	35,000.00			$35,000 unallotted.
For alteration of existing carriages for ten-inch and fifteen-inch smooth-bore guns to adapt them to present service conditions.	50,000.00	Mar. 25, 1891	50,000.00	
For machines, and for improvement of existing plant at the Watertown Arsenal, Massachusetts, for the manufacture of seacoast gun carriages, including those of new design.	27,000.00	....do	27,000.00	
For sights and implements for guns and for fuses	6,000.00	....do	6,000.00	
For machinery and tools for the manufacture of fuses at Frankford Arsenal, Pennsylvania.	8,500.00	....do	8,500,00	
For inspecting instruments, gauges, and templets, for the manufacture of cannon	5,000.00	....do	5,000.00	
For powders for issues to the service, namely: For siege guns; for seacoast mortars of twelve-inch caliber; for seacoast high-power steel guns; in all.	40,000.00	....do	40,000.00	
For projectiles for issues to the service, namely: For steel shell or shrapnel for field guns; for cast-iron projectiles for field and siege guns; for cast-iron projectiles for seacoast mortars of twelve-inch caliber; for cast-iron projectiles for seacoast high-power steel guns; in all.	53,000.00	....do	53,000.00	
For steel shell for siege and seacoast cannon	15,000.00	....do	15,000.00	
For purchase and erection of steel plates for representative experiments upon armored decks.	12,000.00	....do	12,000.00	
For steel armor-piercing projectiles for seacoast guns	100,000.00	....do	100,000.00	
For purchase and erection of armor plate for testing armor-piercing projectiles	24,000.00	....do	24,000.00	
For testing one seacoast breech-loading rifled mortar, steel, of twelve-inch caliber	15,000.00	....do	15,000.00	
For current expenses and maintenance of the ordnance proving ground, Sandy Hook, New Jersey, including general repairs, alterations, and accessories, and including a crane, incidental to testing and proving ordnance, including hire of assistants for Ordnance Board, skilled mechanical labor, purchase of instruments and other supplies, building and repairing butts and targets, clearing and grading ranges, and extending iron tramway.	38,400.00	Mar. 25, 1891	38,400.00	
For the necessary expenses of ordnance officers while temporarily employed at the proving ground and absent from their proper stations, at the rate of two dollars and fifty cents per diem while so employed, and for the compensation of draughtsmen while employed in the Army Ordnance Bureau on ordnance construction, as provided in the fortifications act approved September twenty-second, eighteen hundred and eighty-eight.	9,500.00	May 6, 1891	9,500.00	
For purchase of hoisting engine and steam shovel for grading, and for building and repairing proof butts at the proving ground, Sandy Hook, New Jersey.	3,800.00	....do	3,800.00	
For purchase of oil-tempered and annealed steel for high-power coast-defense guns of eight, ten, and twelve inch caliber, in quality and dimensions conforming to specifications, subject to inspection at each stage of the manufacture, and including all the parts of each caliber.	800,000.00	Mar. 25, 1891	800,000.00	
Provided, That no contract for the expenditure of any portion of the money herein provided, or that may be hereafter provided, for the purchase of steel shall be made until				

the same shall have been submitted to public competition by the Department by advertisement.				
For carriages for steel breech-loading seacoast guns, procured under the fortification act of September twenty-second, eighteen hundred and eighty-eight.	100,000.00	Mar. 26, 1891	35,000.00	$65,000 unallotted.
For two gun carriages of the disappearing type: Together with the sum of thirteen thousand five hundred dollars appropriated for one ten-inch disappearing gun carriage by the act of March second, eighteen hundred and eighty-nine, which sum is hereby reappropriated for the object herein mentioned.	56,500.00	May 6, 1891	56,500.00	Of the $70,000 allotted May 6, 1891, $13,500 is under fortification act approved March 2, 1889, and has been placed as an allotment under that act.
Army Gun Factory, Watervliet Arsenal, West Troy, New York: For boring lathe and planer adapted to the manufacture of siege guns and howitzers in small gun shop at the Army Gun Factory.	4,100.00	Mar. 25, 1891	4,100.00	
To complete Army Gun Factory building at Watervliet Arsenal, West Troy, New York, by the erection of south wing, inclusive of ways for traveling cranes.	248,743.00	....do.....	248,743.00	
For machinery, tools, power plant, and fixtures adapted to the manufacture of steel seacoast guns, to complete the equipment of the south wing of Army Gun Factory at Watervliet Arsenal, West Troy, New York.	268,000.00	....do.....	268,000.00	
For iron framework, with adjustable platforms and centers for fitting up shrinkage pit, and for drainage of shrinkage pit at Army Gun Factory.	14,000.00	....do.....	14,000.00	
For locomotive and cars or trucks for shifting guns and material and transportation between gun factory and river wharf.	9,000.00	....do.....	9,000.00	
For increase of facilities at Watervliet Arsenal for shipment by water, including repairs to wharf, dredging, and extending and setting up fifty-ton hand-power loading crane.	6,500.00	....do.....	6,500.00	
Board of Ordnance and Fortification: To enable the Board to make all needful and proper purchases, experiments, and tests to ascertain, with a view to their utilization by the Government, the most effective guns, small arms, cartridges, projectiles, fuses, explosives, torpedoes, armor plates, and other implements and engines of war, and to purchase, or cause to be manufactured under authority of the Secretary of War, such guns, carriages, armor plates, and other war materials and articles as may, in the judgment of the Board, be necessary in the proper discharge of the duty devolved upon it by the act approved September twenty-second, eighteen hundred and eighty-eight.	150,000.00	{May 5, 8, 1891 {Oct. 21, 1891	97,150.00 2,500.00	} Balance, $50,350, unallotted.
Total	2,290,803.00	.....	2,140,453.00	Balance, $150,350, unallotted.

Appropriations made for the objects specified to be expended under the direct supervision of the Board—Continued.

SUMMARY TO OCTOBER 30, 1891.

Act.	Total appropriations.	Total allotments, expenditures, and reverting to Treasury.	Total balances on hand not allotted or expended.	Remarks.
Fortification, Sept. 22, 1888	$3,972,000.00	$3,889,245.76	$72,754.24	The expenditures for which no formal allotments were made, but which were paid by the disbursing officer of the Board (the recorder), on vouchers approved by the president of the Board, were $556.20 selecting site for ordnance proving grounds, and $5,567.50 personal expenses of members of the Board, pay of clerk and stenographer, and messenger, stationery, miscellaneous supplies, office furniture, and express charges.
Army appropriation, Mar. 2, 1889	56,000.00	3,156.20 52,843.80	.....	
Fortification, Mar. 2, 1889	1,233,594.00	1,170,819.00	62,775.00	
Fortification, Aug. 18, 1890	3,832,935.20	3,319,071.00	513,864.00	
Fortification, Feb. 24, 1891	2,290,803.00	2,140,453.00	150,350.00	
Grand totals	11,385,332.00	10,585,588.76	779,743.24	

Total allotments	$10,526,625.26
Total expenditures without regular allotments	6,123.70
Total turned into Treasury	443.80
Total reverting to Treasury by lapse of appropriation	52,400.00
Total	10,585,588.76

Appendix B.

SPECIFICATIONS GOVERNING THE MANUFACTURE AND INSPECTION OF STEEL FOR CANNON, PRESCRIBED BY THE ORDNANCE DEPARTMENT, U. S. ARMY.

PART I.—GENERAL SPECIFICATIONS.

1. Metal.

The metal used shall be low steel, melted by the open-hearth process, and cast into suitable ingots at the works of the contractor. For special purposes and for some small parts crucible steel shall be used when required.

2. Marking forgings during manufacture.

The manufacturers shall devise and use plans for marking forgings, pieces for forgings cut from ingots, etc., which shall determine with certainty that end or part of the forging, piece, etc., which was nearest to the top of the ingot as cast, and in case more than one piece is cut from any one ingot, the relative positions of the several pieces in the ingot, and which shall in all cases assure the identification of the forging, piece, etc., with the ingot from which it was made or cut. They shall also determine with certainty the weight of metal cut from the top and from the bottom of each ingot used.

3. Condition of material when delivered.

All the forgings shall be rough finished, except when, for some parts of breech mechanism, it is specifically stipulated that smooth forgings are required; they shall conform strictly to the dimensions shown on the drawings accompanying the contract. The United States requires sound and reliable material, and the pieces shall be free from seams, cracks, sand, slag, folds, or other defects.

4. Allowance of metal for tests.

The manufacturers shall always allow, without cost to the United States, sufficient additional length or size to the pieces to furnish the test specimens required. If no particular part of the piece is designated for the specimens, the instructions of the senior inspector shall be followed.

5. Metal for manufacturers' tests.

Any metal required by the manufacturers for their own mechanical tests at the various stages of manufacture shall be provided for in additional length or size of the pieces over that required by the United States for the tests of acceptance, and in no case, unless by special authorization of the senior inspector, shall the manufacturers use for their own tests any of the metal or length of piece required by the United States.

6. Test of specimens.

If the manufacturers possess a reliable testing machine, and if the results obtained with such testing machine are found to be comparable with those obtained with the United States testing machine at Watertown Arsenal, then the Gov-

ernment specimens required shall be tested by the manufacturers in such manner as shall be prescribed by the United States and in the presence of the inspector; and the inspector shall be furnished with the original notes of the several tests that they may be worked up in his office. Tests made with the United States testing machine at Watertown Arsenal shall always be considered as standard, and any or all specimens may be tested at that place if desired by the United States. The specimens from any one piece shall be tested by the manufacturers within three days of the time they are all finished, except for good and sufficient reasons, to be adjudged as such by the senior inspector. If the manufacturers have no reliable testing machine then all the specimens shall be tested at Watertown Arsenal.

7. Shipment of specimens.

All specimens which are to be tested at Watertown Arsenal, excepting those special additional specimens taken by the United States for information, shall be sent to that place by the manufacturers, by express, at their own expense. All specimens shall pass through the senior inspector's hands for inspection and record.

8. Cost of testing specimens.

All tests made by the manufacturers shall be without cost to the United States. If tests are made at Watertown Arsenal, then the actual cost of testing and recording specimens shall be charged to the manufacturers.

9. Reports of tests.

Summaries of the results of tests of specimens made at Watertown Arsenal will be furnished the manufacturers for their information, but shall be regarded as strictly confidential prior to their publication by the Government.

10. Provisional acceptance.

Pieces which have filled the requirements of manufacture, which are accepted as to physical qualities, which are satisfactory as to dimensions, and which show no defects, shall be received by the United States provisionally, but the manufacturers shall hold themselves liable to promptly replace any piece which may be condemned at any time during machine finishing for any developed effect.

11. Delivery.

A piece shall be considered delivered when it is received provisionally by the United States. The manufacturers shall place such pieces, without charge, on board cars, where they can be taken up by a convenient shipping line, for transportation by the United States.

12. Weight of delivered pieces.

The weight of all pieces shall be determined in the inspector's presence on reliable and accurate scales, which the inspector may verify at any time. The weight should closely correspond with the calculated weight, assuming a cubic inch of steel to weigh 0.285 of a pound; should there be any great variation, and the inspector can not accurately check the weight, then the calculated weight at the required rough finished dimensions shall be taken as correct.

13. Time allowed to replace pieces not accepted or rejected.

If a piece is not accepted on account of unsatisfactory physical qualities shown by the results of test of the first set of specimens presented, the manufacturer shall be allowed six weeks in the case of tubes and jackets for cannon of 8 inches caliber and over, and four weeks in the case of all other pieces, from the date of notification of nonacceptance, in which to present additional specimens, if additional treatment or testing is allowed.

If the manufacturers desire to present additional specimens they shall, within three days from the date they are informed of nonacceptance, notify the senior inspector to that effect. If such notification is not received within that time, or if the manufacturers are informed they can not re-treat or retest the piece, they shall proceed to replace it.

If a piece is finally rejected at the manufacturers' works on account of unsatisfactory physical qualities or dimensions, or on account of defects, or at any time after delivery on account of defects, then the manufacturers shall be allowed six months in the case of tubes and jackets for cannon of 8 inches caliber and upwards; four months in the case of trunnion hoops for cannon of over 8 inches in caliber, and also in the case of tubes and jackets for cannon below 8 inches in caliber, excepting field calibers; three months in the case of tubes for field calibers, and trunnion hoops for cannon of 8 inch caliber, and two months in the case of all other pieces, from the date of notification of rejection, in which to replace the rejected piece, and to present the first set of specimens from the new piece.

14. Use of rejected pieces.

Pieces which are rejected may with the approval of the senior inspector be used for other pieces of smaller dimensions, but such smaller pieces made from a rejected piece must always be subjected to the prescribed tests.

15. Additional specimens required.

Any special additional test specimens required by the United States for information or experiment shall be furnished by the manufacturers at actual cost of labor of preparation, with 10 per centum added for profit, and to cover wear, etc., of tools.

16. Board to determine the gravity of defects.

If a piece is condemned at any time for defects the manufacturers may, with the approval of the Department, submit the piece for the inspection of a board of three officers of the Ordnance Department, and the decision of said board, subject to the approval of the Chief of Ordnance, shall govern as to its acceptance or rejection; and the manufacturers may have a representative appear before said board.

If any piece is finally rejected by said board, or if the manufacturers acknowledging the gravity of the defect submit to the decision of the condemning inspector, then, if the piece has been shipped by the United States from the manufacturers' works, the manufacturers shall pay the cost of shipping the rejected piece back to their works if they desire it shipped back, and they shall prepay the cost of shipping a piece made to replace the rejected piece to the place of rejection.

17. Changes in drawings.

The dimensions shown on the drawings accompanying contracts shall be always subject to such changes as the United States may deem advisable, which do not materially affect the cost of manufacture per pound, or do not decrease the percentage of profit to the manufacturers; and any changes which do materially affect the cost of manufacture per pound, or do decrease the percentage of profit to the manufacturers, shall be paid for at a fair price to be determined by the contracting parties.

18. Payments.

When contracts require the delivery of pieces for the fabrication of more than one kind or caliber of cannon, or more than one set of pieces for a particular caliber, then payment for each set of pieces for each kind or caliber, or for each set for a particular caliber, shall be made the manufacturers on the delivery of each set of pieces, complete, less 5 per centum to be retained by the United States until the completion of the whole contract, or of all the pieces for a particular caliber.

Payments shall be made on bills approved by the proper officers in the manner prescribed by law and regulations.

19. Liability of sureties.

A contract for the manufacture of material for cannon shall be considered completed so far as the liability of the sureties is concerned only when all the pieces to be delivered under said contract have been so far machine-finished as to preclude the possibility of the final rejection of any one of said pieces.

20. Drawings and blank forms.

All necessary drawings shall be provided by the manufacturers, and any copies of drawings furnished by the United States, or any working drawings made by the manufacturers, shall be approved by the senior inspector before they are issued for use at the works. All drawings furnished by the United States shall be considered confidential, and for the use of the manufacturers in the prosecution of the Government work only. All blank forms which may be necessary for the expeditious manufacture of the material, or to facilitate the transaction of business between the senior inspector and the manufacturers, shall be furnished by the manufacturers.

21. Inspection of the manufacture.

The manufacture of material for ordnance constructions shall be open to inspection in all its details by the officers and employés of the Ordnance Department assigned to duty for that purpose, and shall receive the approval of the senior inspector at the works, or such one of his assistants as he may designate, at all its stages.

22. Information and assistance to be given inspectors.

That the requirements of paragraph 21 may be carried out, the manufacturers shall, before commencing the work under any order or contract, inform the senior inspector of their general plans; and during the progress of the work they shall inform him of the chemical composition of each and every ingot, part of ingot or casting, which they propose to use, together with a statement of its casting, size, and condition; they shall inform him, or such of his assistants as he may designate, of the time at which each operation connected, either directly or indirectly, with the manufacture is to take place, and shall give him such notification as may be required to insure his witnessing any particular part of an operation which he may specify; they shall furnish him with a copy of the results of all chemical analyses and mechancial tests made at their works upon any piece under fabrication or in any way connected with the material to be furnished; they shall provide all necessary labor, and allow the use of the necessary tools and implements for the assistance of the senior inspector and his assistants in the performance of any of their duties, and they shall provide within their works suitable and satisfactory office room for instruments, drawings, books, etc., which may be used exclusively by the senior inspector and his assistants.

The officers and employés referred to in paragraph 21 shall have free access at all times to all parts of the manufacturers' works. The details of the operations carried on at the works will be considered confidential so far as the manufacturers may desire.

PART II.—FOR TUBES AND JACKETS.

1. Size of ingot.

Ingots for tubes shall have an area of cross-section in that part of the ingot used for the tube forging at least four times as great as the maximum area of cross-section of the rough forging, except that for tubes for cannon of 12 inches caliber and upward the area of cross-section of that part of the ingot used for the tube forging shall be at least three and one-half times as great as the maximum area of cross-section of the rough forging; the ingots for jackets shall have an area of cross-section in that part of the ingot used for the jacket forging at least three and one-half times as great as the maximum area of cross-section of the rough forging, except that for jackets for cannon of 12 inches caliber and upward the area of cross-section of that part of the ingot used for the jacket forging shall be at least three times as great as the maximum area of cross-section of the rough

forging; and the ingots for lining tubes shall have an area of cross-section in that part of the ingot used for the lining-tube forging at least six times as great as the maximum area of cross-section of the rough forging. If bored ingots are used then the wall of the ingot shall be reduced by forging at least as much as to one-half of its original thickness.

2. Part of ingot to be used.

Only so much of any ingot shall be used for tubes and jackets as shall remain after at least 6 per centum of the total weight of the ingot has been cut from the bottom of the ingot, and at least 30 per centum from the top.

3. Sizes of rough forgings.

Rough forgings shall have only such allowance of metal over the diameters required in the rough-finished piece as will insure the removal of all surface imperfections in rough finishing.

4. Treatment.

Tubes and jackets shall, if desired by the United States, be annealed at high heat either after forging or after rough finishing, and before oil-tempering. This heat will be at least as high as that at which the pieces are subsequently to be heated for oil-tempering.

The pieces shall, after rough boring and turning, be oil-tempered and subsequently annealed or tempered at a lower temperature than that of the previous operation.

5. Oil-tempering.

Tubes and jackets shall generally be heated for oil-tempering vertically, and as evenly as possible; shall be immersed in the tempering fluid in the direction of their axes in such manner and with such arrangement that a current of the fluid will flow through the bore, and the operation shall always be performed on the whole of the piece, never on a part only.

6. Annealing after oil-tempering.

Tubes and jackets shall be heated for annealing as evenly as possible, and the operation shall always be performed on the whole of the piece, never on a part only; but if it be necessary, from the conditions in any case, to vary the degree of the heat at the ends, this variation must be uniform from one end to the other.

Every operation of tempering or annealing must be withessed by the senior inspector or such of his assistants as he may designate, and if unsatisfactory in any way retempering or reannealing shall be ordered in his discretion.

7. Straightening.

When after treatment pieces are found to be bent or warped to such an extent as to render straightening under the press or hammer necessary, they shall be heated for this operation, and the straightening shall be followed by re-treatment. Tubes and jackets when delivered shall be straight and true, free from warp or bend, the exterior being truly concentric with the bore.

8. Number, form, and position of test specimens.

The stem of all test specimens shall, if possible, be taken within the finished interior and exterior surfaces of the piece prolonged.

Tangential test specimens shall be furnished from each tube and jacket as specified in the following table, No. I:

Table No. I.

Caliber of cannon.	Designation of piece.	Kind of test specimen.	Number of specimens from—		Size of specimens.		Minimum distance of axis from end of forging.
			Breech end.	Muzzle end.	Length of stem.	Diameter of stem.	
					Inches.	*Inches.*	*Inches.*
Field cannon of all calibers	Tube	Tensile	2	2	2.0	0.505	1.15
	Jacket	do	2	or 2	2.0	0.505	1.15
Siege cannon of all calibers	Tube	do	2	2	3.0	0.564	1.25
	Jacket	do	3	3	3.0	0.564	1.25
Seacoast cannon of 8-inch caliber and upward to 12-inch caliber.	Tube	do	3	3	3.0	0.564	1.50
	Jacket	do	4	4	3.0	0.564	1.50
Seacoast cannon of 12-inch caliber and over.	Tube	do	4	4	3.0	0.564	1.50
	Jacket	do	4	4	3.0	0.564	1.50

All with screw-ends as required.

9. Physical qualities.

Each of the test specimens should show the physical qualities given in the following table, No. II, which the manufacturer shall aim to obtain:

Table No. II.

Caliber of cannon.	Designation of piece.	Elastic limit.	Tensile strength.	Elongation after rupture.
		Lbs. per sq. inch.	*Lbs. per sq. inch.*	*Per cent.*
Field cannon of all calibers	Tube	46,000	86,000	22.0
	Jacket	50,000	93,000	19.0
Siege cannon of all calibers	Tube	46,000	86,000	20.0
	Jacket	50,000	93,000	18.0
Seacoast cannon of 8-inch caliber	Tube	46,000	86,000	19.0
	Jacket	50,000	93,000	17.0
Seacoast cannon of 10-inch caliber and over	Tube	46,000	86,000	19.0
	Jacket	48,000	90,000	17.0

The forgings shall, however, be accepted as to physical qualities provided no one of the specimens shows results in any particular below the figures given in the following table, No. III:

Table No. III.

Caliber of cannon.	Designation of piece.	Elastic limit.	Tensile strength.	Elongation after rupture.	Contraction of area.
		Lbs. per sq. inch.	*Lbs. per sq. inch.*	*Per cent.*	*Per cent.*
Field cannon of all calibers	Tube	42,000	78,000	20.0	25.0
	Jacket	46,000	86,000	17.0	30.0
Siege cannon of all calibers	Tube	42,000	78,000	18.0	30.0
	Jacket	46,000	86,000	16.0	27.0
Seacoast cannon of 8-inch caliber	Tube	42,000	78,000	17.0	30.0
	Jacket	46,000	85,000	16.0	27.0
Seacoast cannon of 10-inch caliber and over.	Tube	42,000	78,000	17.0	30.0
	Jacket	44,000	83,000	16.0	27.0

Except that for the calibers and pieces enumerated below one, and only one, specimen from each end may be in any one particular lower in its qualitities than

the figures given in table No. III, but must not be in that particular lower than the figures given in the following table, No. IV:

Table No. IV.

Caliber of cannon.	Designation of piece.	Elastic limit.	Tensile strength.	Elongation after rupture.	Contraction of area.
		Lbs. per sq. inch.	*Lbs. per sq. inch.*	*Per cent.*	*Per cent.*
Seacoast cannon of 8-inch caliber.	Jacket	44,000	83,000	14.0	22.0
Seacoast cannon of 10-inch caliber and over.	Tube	40,000	75,000	15.0	25.0
	Jacket	43,000	80,000	13.5	20.0

In addition to the tensile tests prescribed, the tubes and jackets shall be submitted to a powder test or percussive hydraulic test if desired by the United States, with an interior pressure a little (about 1,000 pounds) less than their elastic resistance. No weakness or defect should be developed by these tests, and the manufacturers shall detach rings for mandril or initial tension tests when in special cases they are notified that such rings are desired.

These additional tests will be made under the supervision of the Ordnance Department, and any extra expense incurred by the manufacturers will be paid for as provided in paragraph 15, Part I.

10. *Re-testing.*

If the piece fails to fill the physical requirements of these specifications at either or both ends, an additional set or sets of specimens may be submitted for test, but in such case no one specimen should show results below the figures given in table No. III. If a piece fails to fill the requirements on this second presentation it shall be finally rejected, except when the senior inspector may recommend and the Chief of Ordnance authorize further testing.

11. *Re-treatment.*

When a piece fails to fill the physicial requirements of these specifications and the manufacturers re-anneal or re-temper and re-anneal it, complete tests of both ends shall be made, and the previous tests shall not be considered in deciding upon the acceptance or rejection of the piece.

PART III.—FOR HOOPS.

1. Part of ingot to be used.

Only so much of any ingot shall be used for hoops as shall remain after at least 5 per cent of the total weight of the ingot has been cut from the bottom of the ingot and at least 28 per centum from the top.

2. Size of forgings.

Cylindrical hoops may be either forged or rolled, but will be rolled whenever practicable. The allowance of metal over the rough-finished diameters shall be as slight as possible, especially if the hoops are to be treated as they come from the forge or rolls, and without being machined.

The inspector shall, in his discretion, require the reworking of any hoop on which there is an excessive allowance of metal in any part or throughout, or shall require the removal of the surplus metal by machining.

Trunnion hoops shall vary as little as possible from the rough-finished diameters, and especially the rough-finished dimensions in the vicinity of the rim bases, and any surplus metal shall be removed before treatment.

3. Treatment.

All hoops shall, if desired by the United States, be annealed at a high heat before oil-tempering. This heat will be at least as high as that at which the hoops are to be subsequently oil-tempered. The hoops shall then be oil-tempered and subsequently annealed or tempered at a lower temperature than that of the previous operation.

4. Oil-tempering.

All hoops shall be heated for oil-tempering as evenly as possible, and shall be immersed in the tempering fluid in the direction of their axes, and the operation shall be performed on the whole of the piece, never on a part only.

5. Annealing after oil-tempering.

All hoops shall be heated for annealing as evenly as possible, and the operation shall always be performed on the whole of the piece, never on a part only.

Every operation of tempering or annealing must be witnessed by the inspector, or such of his assistants as he may designate, and if unsatisfactory in any way, re-tempering or re-annealing shall be ordered in his discretion.

6. Representative treatment.

Whenever the treatment to which hoops are subjected is to be representative, *i. e.*, when two or more hoops are treated together in the final annealing and all are not to be tested, then that operation must be witnessed by the inspector or one of his assistants, or the test made of one hoop will not be taken to represent the other or others, and in all such cases of representative treatment the proposed disposition of the hoops for treatment must receive the approval of the inspector before the operation is commenced.

7. Number, position, and form of test specimens.

The stem of all test specimens shall, if possible, be taken within the finished interior and exterior surfaces of the hoop prolonged.

Tangential test specimens shall be furnished from each trunnion hoop, as specified in the following table, No. V.

Table No. V.

Caliber of cannon.	Number of test specimens.		Size of specimens.		Minimum distance of axis from end of hoop.
	Breech end.	Muzzle end.	Length of stem.	Diameter of stem.	
			Inches.	*Inches.*	*Inches.*
Field cannon of all calibers	2 or 2		2.0	0.505	1.15
Siege-cannon of all calibers	3 or 3		3.0	0.564	1.25
Seacoast guns of 8 inches caliber and over	4 or 4		4.0	0.564	1.25
Mortars of 8 inches caliber and over	3 or 3		4.0	0.564	1.25

All with screw ends, as required.

Tangential test specimens shall be furnished from cylindrical hoops, as specified in the following table, No. VI.

Table No. VI.

Rough-finished size of hoops.	Number of test specimens.			Size of specimens.		Minimum distance of axis from end of hoop.
	From breech end.	From muzzle end.	From hoop.	Length of stem.	Diameter of stem.	
				Inches.	*Inches.*	*Inches.*
Not more than 8 inches inside diameter. Not more than 30 inches long.	.....	.....	1	2.0	0.505	1.15
Not more than 8 inches inside diameter. More than 30 inches long.	1	1	.....	2.0	0.505	1.15
More than 8 inches inside diameter. Not more than 16 inches inside diameter. Not more than 30 inches long.	.....	.....	2	3.0	0.564	1.25
More than 8 inches inside diameter. Not more than 16 inches inside diameter. More than 30 inches long.	2	2	.....	3.0	0.564	1.25
More than 16 inches inside diameter. Not more than 34 inches inside diameter. Not more than 26 inches long.	.....	.....	3	4.0	0.564	1.25
More than 16 inches inside diameter. Not more than 34 inches inside diameter. More than 26 inches long.	3	3	.....	4.0	0.564	1.25
More than 34 inches inside diameter. Not more than 25 inches long.	.....	.....	4	4.0	0.564	1.25
More than 44 inches inside diameter. More than 25 inches long.	4	4	.....	4.0	0.564	1.25

All with screw ends, as required

8. Physical qualities.

The test specimens should show the mean physical qualities given in the following table, No. VII, as a minimum.

Table No. VII.

Size of specimens.		Elastic limit.	Tensile strength.	Elongation after rupture.
Length of stem.	Diameter. of stem.			
FOR TRUNNION HOOPS.				
Inches.	*Inches.*	*Lbs. per sq. inch.*	*Lbs. per sq. inch.*	*Per cent.*
2.0	0.505	50,000	90,000	18.0
3.0	0.564	50,000	90,000	15.0
4.0	0.564	50,000	90,000	12.0
FOR CYLINDRICAL HOOPS.				
2.0	0.505	50,000	90,000	18.0
3.0	0.564	53,000	93,000	15.0
4.0	0.564	53,000	93,000	12.0

Provided, that for trunnion hoops one specimen may be, in any one particular, below the figures given in Table No. VII, but not lower than 48,000 pounds per square inch in elastic limit, 88,000 pounds per square inch in tensile strength, or 1 per cent less than given in elongation after rupture; and provided further, that for cylindrical hoops, when three or four specimens are taken, one of these specimens, or one from each end, and no more, may be, in any one particular, below the figures given in Table No. VII, but not lower than 50,000 pounds per square inch in elastic limit, 90,000 pounds per square inch in tensile strength, or 12 per cent in elongation after rupture.

But for cylindrical hoops the inspector may arrange with the manufacturer, before any work is done, to make the treatment representative when more than one hoop is made from an ingot; provided, that at least one-half of the total number of hoops made from any one ingot shall be tested, and that the inspector shall designate which one or ones of the hoops shall be tested. In case of such representative treatment the rejection of the tested hoop shall carry with it the rejection of the hoop or hoops represented by such tests, unless it shall happen that there be on a non-tested hoop sufficient extra metal to allow its test to the satisfaction of the inspector, in which case the non-tested hoop shall be tested, and its acceptance or rejection shall depend on the results of test of the specimens taken from it. The inspector shall from time to time require a specimen or specimens, not exceeding the number required for such hoops, to be taken from any nontested hoop and nontested end of trunnion hoops, to judge of the uniformity of treatment.

9. Re-testing.

If any hoop fails to fill the physical requirements of these specifications at either or both ends, an additional set or sets of specimens, or a number less than originally required, in the discretion of the inspector, may be submitted for test, in which case the set or sets of specimens must fill the requirements as to physical qualities, and each of the reduced number of specimens must show qualities as high as the mean qualities required. A hoop failing to pass on the submission of additional specimens shall be finally rejected, except where the senior inspector recommends and the Chief of Ordnance authorizes further testing.

10. Re-treatment.

When a hoop fails to fill the physical requirements of these specifications and the manufacturers re-anneal or re-temper and re-anneal it, complete tests shall be made of one or both ends, as the case may be. Representative re-treatment shall

be conducted under the conditions, restrictions, and limitations prescribed for original representative treatment.

11. Definition of hoop.

The term cylindrical hoop used in these specifications shall be construed to mean all those forgings which are to be used over a tube or jacket in constructing a gun, by whatever name they may be designated, either as hoop, ring, sleeve, etc., and also all bushings for the breech.

PART IV.—FOR PARTS OF BREECH MECHANISM.

1. Part of ingots to be used.

Only so much of any ingot shall be used for breech-mechanism forgings as shall remain after at least 5 per cent of the total weight of the ingot has been cut from the bottom of the ingot and at least 28 per cent from the top.

2. Size of forgings.

Parts of breech mechanism, excepting those expressly required as smooth forgings, shall be rough-finished before treatment; but the inspector may, in his discretion, if the conditions warrant it, waive this requirement entirely, or may only require the removal of any excessive allowance of metal, in places, by machining; parts, however, which are to be used and which are shown on the drawings bored or pierced, shall always be bored or pierced before treatment.

3. Treatment.

Parts of breech mechanism, or such of them as may be desired by the United States, shall be annealed at a high heat before oil-tempering. This heat will be at least as high as that at which the parts are to be subsequently oil-tempered. The parts shall then be oil-tempered and subsequently annealed or tempered at lower temperature than that of the previous operation.

4. Oil-tempering.

Parts of breech mechanism shall be heated for oil-tempering as evenly as possible and immersed in the tempering fluid as required; the operation shall always be performed on the whole of the piece, never on a part only.

5. Annealing after oil-tempering.

Parts of breech mechanism shall be heated for annealing as evenly as possible, and the operation shall always be performed on the whole of the piece, never on a part only.

Every operation of tempering and annealing must be witnessed by the inspector or such of his assistants as he may designate, and if unsatisfactory in any way, re-tempering or re-annealing shall be ordered, in his discretion.

6. Representative treatment.

The parts of breech mechanism of the same kind made from the same ingot shall, as much as possible, be treated together, and specimens for test taken from one or more of the pieces to represent the whole, as specified in Table No. VIII. Every operation of this kind must be witnessed by the inspector or one of his assistants, or the tests of one piece will not be taken to represent the other or others not tested, and in all such cases the proposed disposition of the pieces for the final annealing must be approved by the inspector before the operation is commenced.

The acceptance or rejection of the tested piece shall, in such case, carry with it the acceptance or rejection of all the other pieces represented by such tests, except that in case of non-acceptance or rejection, when there happens to be on any of the other pieces sufficient metal to allow its being tested to the satisfaction of the inspector, it shall be tested and passed upon separately, or in case there are several pieces represented and no extra metal for test specimens,

one or more of these pieces may be cut up for test to represent the remaining ones, if satisfactory to the inspector. In all cases of representative treatment the manufacturers shall arrange with the inspector the details of the fabrication, and the inspector shall designate which one or ones of the pieces shall be tested.

7. *Number, position, and form of test specimens.*

The stem of all specimens shall, if possible, be taken within the finished exterior and interior surfaces of the piece prolonged, or otherwise they shall be taken just outside the rough-finished lines of the piece; the axis shall, if possible, always be at least 3 inches from axis of the forging.

Test specimens shall be furnished from parts of breech mechanism as specified in the following table, No. VIII.

Table No. VIII.

Name of part.	Caliber of cannon.			Size of specimen.		Minimum distance of axes from end of piece.
	Field cannon of all calibers.	Siege-cannon of all calibers.	Seacoast cannon of 8 inches caliber or over.	Length of stem.	Diameter of stem.	
				Inches.	*Inches.*	*Inches.*
Breech block	One from every fifth.	One from every third.		2.0	0.505	1.15
			Two from every second.	3.0	0.564	1.25
Spindle	One from stem of every fifth.	One from stem of every third.		2.0	0.505	
			Two from head of every second.	3.0	0.564	1.25
Lever handles, breech plates and face plates.	One from every twelfth.	One from every fifth.		2.0	0.505	
			One from every second.	3.0	0.564	
Gas-check cups and gas-check rings.	One from one additional forging for test. To be made for each 10.	One from one additional forging for test. To be made for each 6.		2.0	0.505	0.50
			Two from one additional forging for test. To be made for each 4.	3.0	0.564	0.75
Block-carriers	One from every twelfth.	One from every third.		2.0	0.505	0.75
Hinge pins, rollers, and bars for securing pins.	One from one additional forging for test. To be made for each 25.	One from every fifth.		2.0	0.505	
			One for every third.	3.0	0.564	

All with screwends, as required.

When one (or more) specimen is required from each ten (or other number of) forgings, one specimen will also be required for any less number of forgings, and at least one forging from each ingot and kind of forging shall be tested.

8. Physical qualities.

The test specimens must show the physical qualities given in the following table. No. IX, as a minimum:

Table No. IX.

Name of part.	Size of specimens.		Elastic limit.	Tensile strength.	Elongation after rupture.
	Length of stem.	Diameter of stem.			
	Inches.	*Inches.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*Per cent.*
Breech-block, spindles, hinge-pins, and rollers.....	2.0	0.505	46,000	86,000	18.0
	3.0	0.564	46,000	86,000	16.0
Lever handles, breech plates, face plates, block-carriers, and nuts.	2.0	0.505	40,000	75,000	20.0
	3.0	0.564	40,000	75,000	18.0
Gas-check cups, gas-check rings and bars for securing pins.	2.0	0.505	70,000	125,000	12.0
	3.0	0.564	70,000	125,000	10.0

9. Additional tests.

If any piece separately tested fails to fill the physical requirements of these specifications, an additional set of specimens may be submitted for test. Failing to fill the physical requirements on this additional submission the piece shall be finally rejected except in special cases.

When tests are representative, re-testing shall be subject to the conditions, requirements, and limitations of paragraph 6 of these specifications for parts of breech mechanism.

10. Additional treatment.

When a piece fails to fill the physical requirements of these specifications, and re-annealing, or re-tempering and re-annealing is resorted to, complete tests shall be made, and the previous tests shall not be considered in deciding upon the acceptance or rejection of the piece. Representative re-treatment shall be conducted under the conditions, restrictions, and limitations prescribed for original representative treatment.

11. Parts required as rough forgings.

Those parts of breech mechanism required to be delivered simply as smooth forgings, or as simple castings, and without any requirement as to physical qualities, shall be made with great care, shall conform as nearly as practicable to the rough dimensions shown on the drawings, and shall be made of metal satisfactory to the inspector. Such parts shall be annealed after forging or casting, and shall receive no other treatment.

PART V.—GENERAL DUTIES OF INSPECTORS.

Officers and employés of the Ordnance Department assigned to the duty of inspecting material for ordnance constructions will carefully and constantly watch the details of manufacture in all its stages; keep complete records of the manufacture of each piece; decide all minor questions of detail referred to them by the manufacturers that may arise; and, subject to the confirmation of the Chief of Ordnance, accept all material which fairly fills the contract requirements. They will see that the work and treatment at every stage of progress fill the requirements of the specifications and are such that the test of the specimens to be taken will truly represent the piece, and will inform the manufacturers what additional work, treatment, etc., seem necessary to satisfy this condition.

Generally speaking they will not interfere with the means and methods adopted by the manufacturer for executing his work, but will rather pass upon their character as satisfactory or otherwise, and upon the uniformity of the execution.

In designating the position of and in marking test specimens they will be guided by the following instructions:

Test specimens taken from metal to be used in ordnance construction (excepting those taken from billets for wire drawing) will be marked on both ends to show:

1. The caliber of the cannon for which the metal is intended: 32 for 3.2 inches; 8 for 8 inches; 10 for 10 inches; 12 for 12 inches, etc.

2. The kind of cannon for which the metal is intended: R for steel rifle; MR for mortar; WR for wire-wound rifle; CIR for cast-iron rifle, etc.

3. The number of the cannon of the particular caliber and kind: 1, 2, 3, etc.

4. The part of the cannon for which the metal is intended: T for tube; J for jacket, etc. In the case of cast-iron cannon, or cast-iron bodies for cannon combined of steel and cast-iron, where the specimens are ordinarily taken from the initial tension rings, the abbreviation will be TR, showing that the specimen is from the initial tension ring; and if more than one initial tension ring is taken from either end, the abbreviations TR_1, TR_2, etc., will be used.

5. The end of the piece from which the specimen is taken: B for breech; M for muzzle.

6. The direction in which the specimen is taken: T for tangential, or those taken parallel to a tangent at the circumference; L for longitudinal, or those taken parallel to the axis of the cannon; R for those taken radially.

7. The number of the specimen: 1, 2, 3, etc. The same series of numbers to be used for each end (breech or muzzle) of the piece.

8. The position with reference to the interior and exterior surfaces of the piece of metal: I for inside specimens, or those taken near the interior surface; O for outside specimens, or those taken near the exterior surface; M for middle specimens, or those taken midway between the interior and exterior surfaces.

9. The fact that the specimen has been laid off and stamped in the presence of the inspector or his assistant, and that its identity is vouched for; this is indicated by the inspector's private stamp—the escutcheon of the Ordnance Department, one-quarter of an inch in diameter, on hardened steel.

These marks will appear in the order indicated; those required to indicate the points numbered 1, 2, 3, and 4 (which show from what the specimen is taken) being in one line, the remainder (which show how the specimen is taken) being in a second line just below the first as seen when looking at the end of the specimen. The marks and the inspector's private stamp should always be on the specimen from the time it is laid off until finished, and before they are effaced in one place by any finishing operation must be transferred to some other place in the presence of the inspector or his assistant.

The ring, slice, or piece which is to furnish test specimens, and the forging from which it is to be cut, will each be marked before the cut is taken, and close to the cut, to indicate the points numbered 1, 2, 3, 4, 5, and 9. These marks on forgings should always be on the piece, and before they are effaced in one place by any rough-finishing operation must be transferred to some other place in the presence of the inspector or his assistant.

S. V. BENÉT,
Brig. Gen., Chief of Ordnance, U. S. A.

ORDNANCE DEPARTMENT,
Washington, D. C., September 10, 1888.

Appendix C.

TESTS TO BE APPLIED TO COMPLETED GUN PRESENTED FOR TEST.

BOARD OF ORDNANCE AND FORTIFICATION,
War Department, ——, *1889*.

SIR: The act making appropriations for fortifications, etc., approved September 22, 1888, provides that—

Whenever any party shall present for test a completed single-charge breech-loading steel gun of ten or twelve inches caliber, and of weight and dimensions to be prescribed by the Board with the proper supply of ammunition for the test of the same, such gun shall, in the presence of the party presenting it, be subjected to such tests as the Board shall have prescribed; and should such gun be shown to the satisfaction of the Board by such tests to fulfill the requirements previously prescribed in respect to accuracy, range, power, endurance, and general efficiency, the gun and ammunition shall be paid for at a fair valuation, including cost of transportation, and contract shall be made at a price reasonable in the opinion of the Board with the party presenting the best of such guns for a further supply of similar guns, to be subjected to the usual service test before acceptance, the experimental gun and all guns purchased hereunder to be subject to inspection at each stage of manufacture, as follows, namely: For not less than fifty ten-inch steel guns; and for not less than fifty twelve-inch steel guns.

To meet the requirements of this act the following conditions recommended by the Board of Ordnance and Fortification, have been approved by the Secretary of War, viz:

FOR A GUN OF 10 INCHES CALIBER.

The weight shall be about 30 tons (long).

The length of bore, 34 calibers, measured from the face of the obturator to the face of the muzzle of the gun. (In order that the gun may not require a special carriage for its proof it is desirable that the diameter of the trunnions be 12 inches, and the distance between rimbases 42 inches.)

The power shall be such as may be expressed by a muzzle energy of not less than 15,000 foot tons.

The range shall for 20 degrees of elevation be about 13,650 yards, and corresponding ranges shall be obtained with lower elevations.

The standard of accuracy shall be as given in the following table, and shall be approximately obtained:

Table of accuracy—25 per cent. rectangles.

Range.	Vertical rectangle.		Horizontal rectangle.	
	Height.	Width.	Length.	Width.
Yards.	*Feet.*	*Feet.*	*Yards.*	*Yards.*
1,500	1.4	1.0	.....	.....
3,000	3.4	2.9	.....	.....
6,000	.....	.....	29.7	4.2
8,000	.....	.....	38.9	6.7
10,000	.....	.....	48.5	9.2

The endurance test should not be less than 300 rounds with full charges. After 250 or more rounds may have been fired, the gun may be lined wholly or in part, when at least 50 rounds more will be fired to fully test the strength of the construction. After this the general soundness and efficiency of the gun should not be materially impaired, except so far as may have resulted from erosion.

Should any material modification of the construction be made during the trial, at least 50 rounds, with full charges, shall be fired thereafter.

The weight of projectile to be used with the full charge shall be about 575 pounds.

Three hundred rounds of ammunition shall be the "proper" amount to be supplied with the gun for test.

As a proof of general efficiency the breech mechanism should work freely and be convenient for operating, the opening and closing of the breech to be performed without great difficulty by one man. The projectiles shall admit of being readily handled, inserted and centered in the bore, and not be subject to injury or deformation either in handling or transportation.

A rapidity of fire of 15 rounds per hour shall be attainable, using such appliances for loading as are employed by the Ordnance Department, U. S. Army.

The repairs allowable during the entire trial of a gun, exclusive of the insertion of a lining tube, will be confined to repairing or renewing parts injured during trial. No alterations that may affect the general construction of any part will be made without the sanction of the Board.

FOR A GUN OF 12 INCHES CALIBER.

The weight shall be about 52 tons. The length of bore shall be 34 calibers. (In order that the gun may not require a special carriage for its proof, it is desirable that the diameter of trunnions be 14.5 inches, and the distance between rimbases 49.8 inches.) The power shall be such as may be expressed by a muzzle energy of not less than 26,000 foot tons.

The range shall for 20 degrees elevation be about 14,700 yards, and corresponding ranges shall be obtained with lower elevations.

The accuracy shall be the same as that prescribed for a 10-inch gun.

The endurance shall not be less than 250 rounds, and a lining may be inserted after 200 rounds.

The weight of projectile for full charges shall be about 1,000 pounds.

Other conditions of test shall be the same as for a 10-inch gun, except

that under general efficiency a rapidity of fire of 10 rounds per hour shall be attainable.

It is not considered practicable for the Board to determine, at this time, what will be a "fair valuation" of an experimental gun which shall have fulfilled the requirements prescribed, nor what price would be "reasonable" for a further supply of similar guns. It is believed to be better on all accounts to leave these questions for determination after the actual cost and value of such guns can be known; it being understood as the duty of the Board to act in such matters with entire impartiality as between the United States and any party who shall attempt to supply the desired guns.

The act of Congress does not fix, and does not seem to authorize the Board to fix, any limit of time within which experimental guns shall be presented for test. It is therefore considered sufficient to say that it is regarded by the Board as desirable that the experimental guns be submitted as soon as practicable, and within three years from the present time.

Respectfully, your obedient servant,

_____ _____,

Captain Ordnance Department, U. S. Army,
Recorder of the Board.

Appendix D.

TEST OF CAST-IRON MORTAR.

[House Ex. Doc. No. 158, Fifty-first Congress, first session.]

REPORT RELATIVE TO THE ORDNANCE PROVING GROUND, SANDY HOOK, N. J.

LETTER FROM THE SECRETARY OF WAR, TRANSMITTING A REPORT OF THE TEST OF THE 12-INCH RIFLED MORTAR, PRESENTED BY THE SOUTH BOSTON IRON WORKS, AT THE ORDNANCE PROVING GROUND, SANDY HOOK, N. J.

WAR DEPARTMENT,
Washington, January 27, 1890.

The Secretary of War has the honor to transmit to the House of Representatives, for the information of the Committee on Appropriations, an extract of the proceedings of the Board of Ordnance and Fortification of December 12, 1889, together with the report of Lieut. Col. A. Mordecai, Ordnance Department, United States Army, of the test of the 12-inch cast-iron breech-loading rifled mortar, presented, under the provisions of the first paragraph of section 6 of the act approved September 22, 1888, by the South Boston Iron Works, at the Ordnance Proving Ground, Sandy Hook, N. J.

REDFIELD PROCTOR,
Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

EXTRACT OF PROCEEDINGS OF THE BOARD OF ORDNANCE AND FORTIFICATION.

WAR DEPARTMENT,
Washington, D. C., December 12, 1889.

* * * * * * *

The Board then considered the report of the tests of the 12-inch breech-loading cast-iron rifled mortar of the South Boston Iron Works, submitted by the Chief of Ordnance under date of November 1, 1889, and referred to the Board November 4, 1889, by the Secretary of War.

The muzzle of the mortar was broken into three pieces, all of which went front, one to a point only a few feet in rear of where the projectile first stru ground.

The shell was found to be cut quite deeply in several places on the cylindric on the conoidal portions as though scraped by the lands on pieces of the broke tar. One of the muzzle fragments is thought to indicate quite plainly the work upon the projectile.

During all the firings there were present Mr. W. P. Hunt, jr., representi South Boston Iron Works, and one or more members of the Board of Ordnan Fortification.

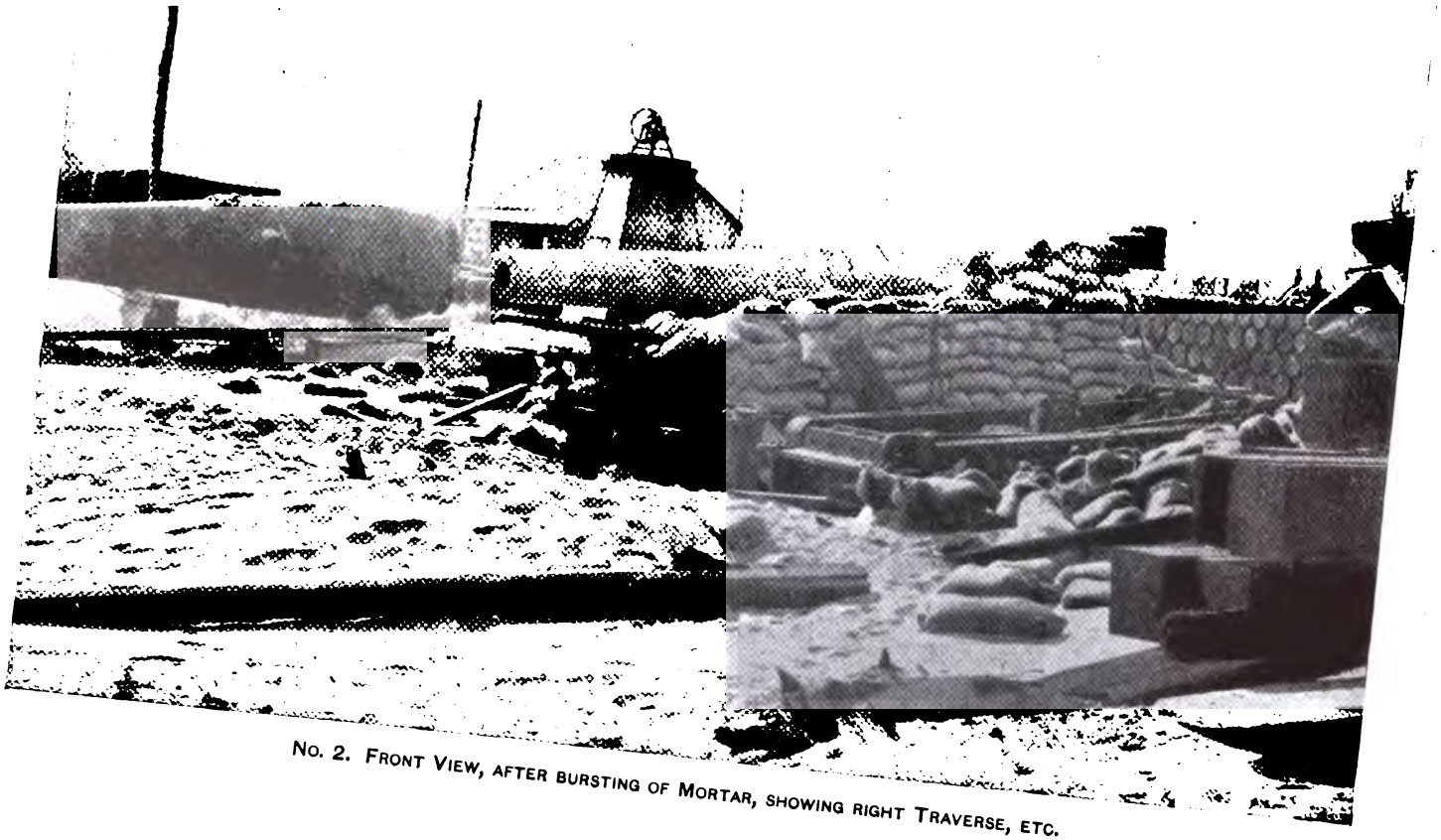
There are forwarded herewith:

(1) The firing record.
(2) Drawing No. 1, showing the lines of fracture of the mortar.
(3) Drawing No. 2, showing size and location of fragments of mortar after ru
(4) Photograph No. 1, front view of mortar before bursting.
(5) Photograph No. 2, front view, after bursting of mortar, showing right tr etc.
(6) Photograph No. 3, front view after bursting of mortar, showing left tr etc.
(7) Photograph No. 4, view from rear, after bursting of mortar, showing sh protection of velocity wires, struck by projectile at its first graze, etc.
(8) Photograph No. 5, view of rear traverse, and breech-block where it land
(9) Photographs Nos. 6, 7, and 8, views of projectiles, all sides shown.

A. MORDECAI,
Lieutenant Colonel Ordnance Dept., U. S. Army, Commandi

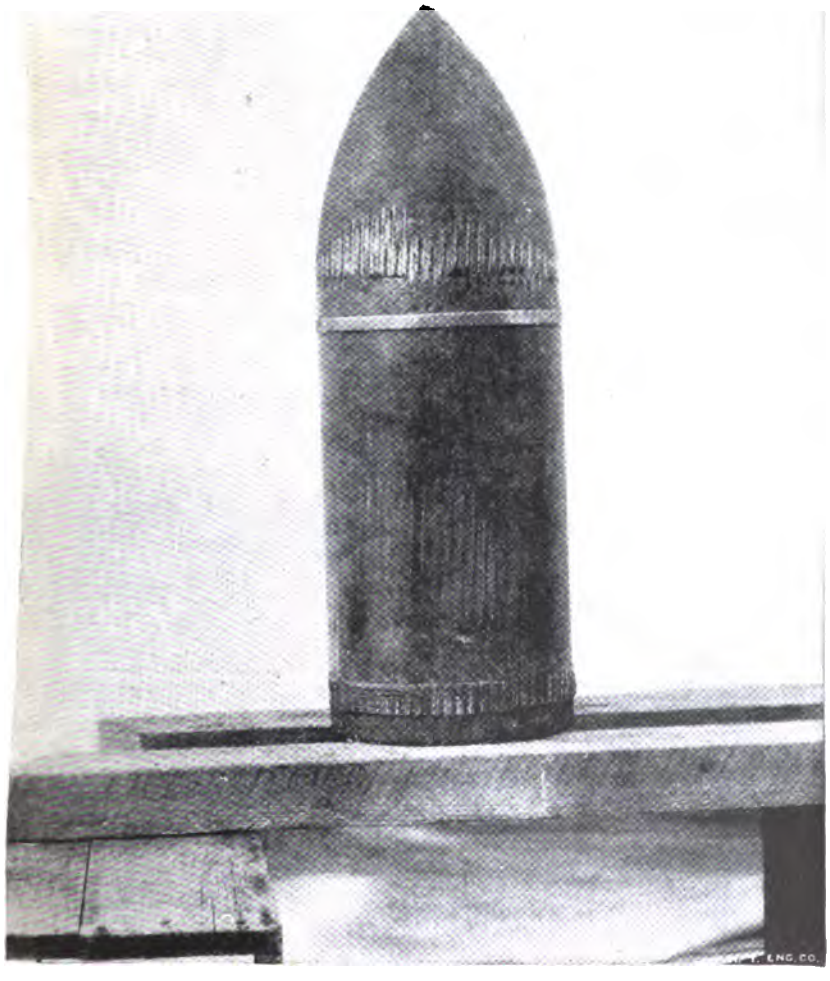
NEW YORK ARSENAL, *October* 28, 1889.

No. 1. Front View of Mortar before bursting.



No. 2. Front View, after bursting of Mortar, showing right Traverse, etc.

No. 3. Front View after bursting of Mortar, showing left Traverse, etc.



No. 6. THE RIGHT ELEMENT OF THE PROJECTILE IN PHOTOGRAPH IS THE ONE THAT WAS AT THE HIGHEST POINT WHEN THE SHELL WAS LOADED IN THE MORTAR.

Record of firing with 12-inch B. L. rifled mortar (cast-iron), South Boston Iron-Works, at Sandy Hook, N. J., October 3, 1869.

[Object of firing: to test mortar.]

No. of fire.	Powder. Kind.	Powder. Weight.	Weight of projectile (mortar shell; lot 241).	Travel of shot in bore.	Elevation.	Instrumental velocity — feet from mussle.	Pressure, pounds per square inch of bore.	Recoil.	Counter recoil.		Special remarks about each fire, such as effect on piece, action of breech mechanism, consumption of powder, sound of projectile in flight, scattering of fragments, etc., and metrological data.
		Pounds.	*Pounds.*	*Feet.*	° ′	*Feet.*		*Feet.*	*Feet.*		
						939	A				
1	(*)	50	624	91.9	0 30	939	18,840	50½	45½	Gun mounted on 15-inch barbette carriage, F. P. Timby's. Bolster and forks removed and chassis placed upon wooden frame; three-eighths inch was filed off the vent shield to allow primer and wrench to enter. Pressure plugs in the obturator head, A above, B below, in a vertical line. The cylinder was just filled with oil and then 4 gallons were taken out. After round 1, 2 gallons of oil were added to the cylinder. After round 4, 2 gallons of oil were added to the cylinder. Fired into sand butt, section 4. Obturating electric primers. During the firing the gun and carriage moved back about 2 feet, owing to the rear support giving way.	Breech-block closed and opened easily; obturation good.
						938	B				
							20,240				
						939	A				
2	(*)	55	626	92.1	0 25	938	21,620	51	46		Do.
						937	B				
							20,400				
						939	A				
3	(*)	55	624	91.6	0 20	937	21,140	51	47		Do.
						935	B				
							20,120				
						936	A				
4	(*)	60	616	91.7	0 15	936	23,180	51½	48½		Do.
						935	B				
							22,740				
						1,021	A				
5	(*)	65	627	91.7	0 15	1,020	26,075	51½	48½		Breech-block did not close or open quite so easily as in previous rounds. Console opened slightly; obturation good.
						1,019	B				
							23,935				
						1,015	A				
6	(*)	65	617	91.6	0 15	1,015	24,935	49	45		Breech-block closed and opened easily; obturation good.
						1,014	B				
							23,300				
							A				
7	(*)	65	627½	91.6	0 15	Not taken	26,060				Do.
							B				
							23,089				

* Du Pont's Sphero-Hexagonal, O. X. C. Density, 1.795; granulation, 100.

Present, Col. H. L. Abbot, Col. H. W. Closson, and Lieut. Col. A. Mordecai, on part of the Board of Ordnance and Fortification, and Mr. W. P. Hunt, jr., and Mr. H. Sinclair representing the South Boston Iron-Works. Col. H. L. Abbot and Col. H. W. Closson not present at round 7.

Record of firing with 12-inch B. L. rifled mortar (cast-iron), South Boston Iron-Works, at Sandy Hook, N. J., October 4, 1889.

[Object of firing: to test mortar.]

No. of fire.	Powder. Kind.	Powder. Weight.	Weight of projectile (mortar shell; lot 241).	Travel of shot in bore.	Elevation.	Instrumental velocity—feet from muzzle.	Pressure, pounds per square inch of bore.	Recoil.	Counter recoil.		Special remarks about each fire, such as effect on piece, action of breech mechanism, consumption of powder, sound of projectile in flight, scattering of fragments, etc., and metrological data.
		Pounds.	*Pounds.*	*Feet.*	° ′	*Feet.*		*Feet.*	*Feet.*		
8	(*)	65	630	91.6	0 15	Not taken.	A 25,750 B 25,563	48	41	Nut on spindle of mushroom head tightened before firing. Supports in rear of carriage were renewed before firing round 8. Pressure plugs in the obturator head in a vertical line, A above, B below. Fired into sand butt, section 4. Obturating electric primers.	Breech-block closed and opened easily; obturation good. Console spring catch did not hold, causing interruption in closing breech-block. Obturation good.
9	(*)	67	628	91.75	0 15	Not taken.	A 27,600 B 25,725	48	42		Action of catch, same as in round 9. Obturation good.
10	(*)	67	628	91.6	0 15	1,029 1,029 Lost.	A 26,440 B 25,700	49	43		Do. Breech-block closed and opened easily. Obturation good.
11	(*)	69	628	91.7	0 15	1,052 1,052 Lost.	A 27,930 B 26,950	50	44		Do.
12	(†)	50	631	91.7	0 10	971 972 972	A 28,400 B 27,400	51	44		
13	(†)	47	623	91.5	0 5	936 937 937	A 25,860 B 25,320	44½	38		

* Du Pont's Hexagonal E. V. K. Density, 1.750; granulation, 72. † Du Pont's Sphero-Hexagonal O. X. C. Density, 1.795; granulation, 100.

Present, Col. H. L. Abbot, Col. H. W. Closson, and Lieut. Col. A. Mordecai, on part of the Board of Ordnance and Fortification, and Mr. W. P. Hunt, jr., and Mr. H. Sinclair, representing the South Boston Iron-Works.

Record of firing with 12-inch B. L. rifled mortar (cast-iron), South Boston Iron-Works, at Sandy Hook, N. J., October 5, 1869.
[Object of firing: to test mortar.]

No. of fire.	Powder. Kind.	Powder. Weight.	Weight of projectile (mortar shell; lot 241.)	Travel of shot in bore.	Elevation.	Instrumental velocity—feet from muzzle.	Pressure, pounds per square inch of bore.	Recoil.	Counter recoil.		Special remarks about each fire, such as effect on piece, action of breech mechanism, consumption of powder, sound of projectile in flight, scattering of fragments, etc., and metrological data.
		Pounds.	*Pounds.*	*Feet.*	° ′	*Feet.*		*Feet.*	*Feet.*		
						965	A				
14	(*)	50	624	91.6	0 5	965	27,550	45½	38		Breech-block closed and opened easily. Obturation good.
						965	B				
							26,950				
						953	A				
15	(†)	50	624	91.5	0 5	954	24,750	45½	38		Do.
						954	B				
							24,125				
						1,002	A				
16	(†)	55	624	91.65	0 5	1,001	27,785	47	39		Do.
						1,000	B				
							26,120				
						1,004	A			Pressure plugs in obturator head in a vertical line, B above, A below. Fired into sand butt; section 4. Obturating electric primers.	
17	(†)	55	624	91.6	0 10	1,003	27,600	48	40		Breech-block closed and opened easily. Obturation good. Console opened one-half inch during firing.
						1,002	B				
							26,500				
						1,031	A				
18	(†)	57	624	91.6	0 00	1,031	28,760	49½	40½		
						1,030	B				
							28,140				Breech-block closed and opened easily. Obturation good. Console opened three-quarter inch during firing.
						1,008	A				
19	(‡)	55	624	91.4	0 5	1,011	28,600	40	41		
						1,013	B				
							27,580				Do.
							A				
20	(‡)	55	624	91.5	0 10	Lost.	29,930				
							B				
							28,180				Gun burst, demolishing carriage.

* Du Pont's Hexagonal E. V. K. Density, 1.750. † Du Pont's Sphero-Hexagonal P. G. Density, 1.775. ‡ Du Pont's Sphero-Hexagonal O. V. Density, 1.750.

Present, Col. H. L. Abbot and Lieut. Col. A. Mordecai, on part of the Board of Ordnance and Fortification, and Mr. W. P. Hunt, jr., representing the South Boston Iron Works.

Cannon—where made, South Boston Iron-Works; weight of piece, 14 tons; total length, 129 inches; length of bore, 107.625 inches; kind of carriage, 15-inch timbers, upper carriage blocked against rubber buffers. Second carriage controlled by hydraulic recoil cylinder. Carriage mounted on timbers supported against posts sunk in sand; kind of pressure gauge, crusher; location of pressure gauge, in face of obturation head; kind of ballistic instrument, Le Boulangé chronographs, Nos. 112 and 314; kind of breech-closure, De Bange slatted screw; diameter of powder-chamber, 12.4 inches; nominal length of powder-chamber, 18.82 inches; pitch of rifling, 1 turn in 35 calibers; number of grooves, 68; width of grooves, 0.379; depth of grooves 0.07 inches; width of lands, 0.17496 inches.

A. MORDECAI,
Lieut. Col., Ordnance Department, Commanding.

NEW YORK ARSENAL, *October 22, 1869.*

Appendix E.

EXPERIMENTS WITH HIGH EXPLOSIVES.

WASHINGTON, D. C., *June 5, 1889.*

GENERAL: The committee appointed at the last meeting of the Board has the honor to submit the following report:

Experiments with high explosives for use of bursting charges of shells may be regarded by the Board from two points of view: (1) as a matter of investigation to determine experimentally many points now doubtful as to the physical properties, and best modes of treating types; and (2) as a matter of testing to determine the merit of the several devices submitted by inventors. It is desirable that these investigations and tests should be carried forward together and at once.

High explosives will be used in two different kinds of shells, viz: armor-piercing and common. The difficulties to be overcome with the former are vastly greater than with the latter. Moreover the necessity for piercing armor is less than formerly, because the area heavily plated on war ships is becoming less and less. Thus only about half of the water line is protected by armor in recent British types, and in French ships even the guns themselves are often fired from exposed barbettes. The chief dependence against sinking is in the under-water armored deck, usually about 3 inches thick, and the water-tight compartments. The experiments now in progress with the *Resistance* in England demonstrates that the effects of common shell even of small calibers, charged with high explosives, are disastrous when occurring within the unarmored part of the hull. Finally, the expense of iron plates for targets for the armor-piercing class is so great that it appears to be wise for us to begin with common shell, and leave armor-piercing trials for a later date.

For successful use of high explosives in common shells three elements must be considered: (1) the envelope, (2) the explosive, (3) the igniting mechanism.

Cast iron as a material for the envelope is too uncertain to command confidence when the result of a slight defect may be the destruction of the gun by premature explosion. Even in experimenting, experience has shown that no doubt as to the character of the projectile should be tolerated. It is therefore advised that those to be ordered be made of good open-hearth steel.

As to patterns, it is desirable that such be chosen as can be fitted to receive different internal arrangements for loading. Those of the Ordnance Department marked "Ordnance Board, U. S. Army, Governors Island, December 24th, 1888," and "January 7th, 1889," are well suited for the projected trials, and are recommended for adoption. They have

the Eureka sabot for use in muzzle-loading guns; and the following are the more important dimensions.

	7-inch.	11-inch.	15-inch.
Estimated weight in pounds	120	430	1,325
Length of body in calibers	2.75	2.5	3.5
Radius of ogival in calibers	1.5	1.5	1.5
Total length in inches	20.5	29	54.5
Thickness of wall in inches	1.3	2.25	2
Capacity in cubic inches	160	495	3,348
Capacity in pounds of water	5.8	18	124

As to the explosive, we have now before the Board explosive gelatine, gun cotton, Emmensite, the Schwalm mixture, dynamite, and Americanite, or the Smolianinoff compound.

Experiments of the kind to be undertaken involve no little time, labor, and expense, and they should therefore be restricted to what promise ultimate success. This is not the case with the Americanite, because the liquid form and the liability to become dangerous through evaporation or by lying in store would forbid its use in the military service, unless trials should demonstrate that no other variety free from these objections can be so used. That this explosive is liable to deterioration has been proved to the satisfaction of your committee by the results of a personal examination of a sample left in store at Sandy Hook after the trials made by the Ordnance Board in November, 1887. This sample is contained in a glass bottle, stored in a magazine of the fort. On April 5, 1888, a surface stratum of different appearance from that below was noted by Col. Mordecai. It was then half an inch thick. On July 10 it was fifteen thirty-seconds of an inch thick. On January 3, 1889, it was fully half an inch thick. On March 26, 1889, the date of our inspection, it was seven thirty-seconds of an inch thick, the whole height being 6 inches. Samples of the two strata were then carefully taken with a pipette and at once tested with a hammer on an iron slab. The upper gave no decrepitation, but the lower acted in all respects like pure nitroglycerine, except that it was perhaps a trifle less sensitive. Stirring the mixture with a glass rod produced no apparent change or recombination of the fluid; but at a subsequent examination, on June 1, a great change had occurred. The appearance then was for 2 inches at the bottom a white fluid; above that for about 1 inch a cloudy combination of white and yellow fluid; the remaining fluid to surface was of uniform yellow color. An explosive possessed of such characteristics would be extremely dangerous in a loading room, and your committee therefore recommends that the action already taken by the Board on March 14th, 1889, in advising that experiments with this explosive be deferred for the present be adhered to. As to dynamite, it is well known to be far more sensitive to shocks than others on the list, and as none of the inventors seem to prefer it to explosive gelatine for testing their loading devices, it is recommended that it be left untried for the present. This reduces the list to explosive gelatine, gun cotton, Emmensite, and the Schwalm mixture.

As to the igniting mechanism, the following conditions should be fulfilled by a pattern suitable for use in coast defense. The class of fuse should be percussion, with base action and a slight delay action, and with a sensitiveness adjusted for a projectile striking the unarmored side of a war ship. To insure an explosion of the first order in the charge of the shell, a detonating primer of great intensity is essential. An initial explosion of mercuric fulminate, say 10 grains, in a large

priming charge of dry gun cotton or other high explosive will probably be required to insure an explosion of the first order in a nonsensitive explosive suited for use in shells (one pound is used with wet gun cotton), and provision must be made accordingly. It is recommended that the Ordnance Department be requested to give this matter special attention, as the original devices we have received from inventors appear crude and unpractical. If possible, samples of the base fuse of Wolff & Co., should be obtained at Walsrode, Germany, as it is claimed to fulfill all conditions and to act perfectly.

From this résumé it appears that the following points are to be investigated:

(1) *Which is the best explosive for use in shells?*—To decide this point we must consider: (*a*) safety in handling and storage, regard being had to ordinary shocks and friction in handling, to deterioration in store, and to extremes of heat and cold; (*b*) Intensity of action when exploded; and (*c*) Density of loading. Should the trials prove that several varieties of high explosives can be safely fired in projectiles, the ultimate choice between them will depend on these considerations; and they should also largely influence the order in which trials are made. Much information as to (*a*) is already in our possession, and the means of extending it need not be further considered here. The trials at Willets Point probably afford as accurate an idea of intensity of action (*b*) as can be had. They indicate that, assuming dynamite No. 1 as 100, explosive gelatine is 142, dynamite No. 2 is 83, and gun cotton is 87. The corresponding value of Emmensite will soon be determined from trials now in progress. As to density of loading, (*c*), the specific gravity of explosive gelatine is about 1.54, that of compressed gun cotton being about 1.2, and that of Emmensite No. 1 in the fused form about 1.7. Dynamite No. 1 varies from unity in powder to about 1.6 in compressed cartridges. From these figures, and the special devices to prevent premature explosions, the density of loading may be computed.

(2) *Is an explosion of the first order, or detonation, assured with the different modes of loading proposed by the inventors to prevent premature explosion?*—To test this matter it is proposed to explode duplicate sets of cast-iron shells like those shown on page 229, Report of the Chief of Ordnance for 1884 (caliber, 8-inch; cavity, 5 inches in diameter and 10 inches deep; capacity, about 192 cubic inches, or 6.9 pounds of water). One set will be charged precisely as proposed by the inventor; the other will contain the same amount of the explosive in a compact mass with the rest of the cavity sand-filled. The projectiles will be placed at the bottom of holes about 8 inches in diameter and 4 or 5 feet deep, bored in uniform clay soil and tamped with sand. From the measured crater radii after the explosion it is believed that a fair idea can be formed as to whether the loading devices reduce the order of the explosion. The following trials of this nature are recommended, all to be duplicated, and if necessary more than duplicated, to assure accuracy; about forty shells should be provided:

Four shells to test the Stevens's method of loading with explosive gelatine.

Four shells to test the Graydon-Pratt method of loading with pellets of explosive gelatine.

Four shells to test the Graydon-Pratt method of loading with tubes of explosive gelatine pellets.

Four shells to test the relative power of Emmensite in a fused and in a coarsely granulated condition.

Four shells to test the German mode of packing Wolff gun cotton with paraffine and Carnauba wax (half and half).

(3) *Will the explosive stand the friction due to rifled motion when loaded as proposed?*—To obtain more definite information as to the heating effect of this motion than is now available, it is proposed to communicate a high rotary velocity to projectiles by mechanical means, and thus to investigate the subject practically. The details of apparatus for this purpose have not yet been sufficiently studied for definite recommendation at this time. A velocity of about 1,400 feet, with rifling of one turn in 35 feet, will call for a rotary velocity of 2,400 turns per minute.

(4) *Will the explosive stand the shock of firing when loaded as proposed by the different inventors?*—To test this matter it is proposed to purchase one hundred 7-inch and fifty 11-inch projectiles, of the patterns described above, and to fire them from the Ames gun and from the 11-inch converted muzzle-loading rifle at Sandy Hook. The cost of these projectiles is roughly estimated at about $10,000. The methods of loading to be tested are the Stevens, the Graydon pellet, and the Graydon tube, all with explosive gelatine; also, if thought best, the Schwalm explosive. Also the behavior of Emmensite and Wolff gun cotton fired with no special mechanical provisions in the shell—the former being packed by fusion and the latter by the German mode of melted paraffine. All these experiments should be made by firing at long ranges over water, so that a practical test of the effect of rifled motion as well as the shock of firing may be had.

(5) *Will the igniting mechanism stand the shock of firing and the rifled motion without premature action?*—This matter should be tested quite independently of the explosive, which may be accomplished by using shells charged with powder in a field or siege gun, or perhaps by charging several primers in one shell, thus reducing expense.

(6) *Will the igniting mechanism act as desired?*—This may be tested by firing shells charged with powder.

(7) *Will the shell, without the igniting mechanism, explode on impact (a) with water, (b) with earth, (c) with stone, (d) with wood or light iron, and (e) with iron armor?*—Information on some of these points will be obtained incidentally, and the others may be left for future consideration.

This series of trials will determine whether it will be needful to resort to the complicated and costly double projectiles proposed by some inventors—information which should be secured before incurring the expense of fabricating them. They cover all that appears to be demanded at present, except to test Dr. Cook's device, which, being rather an incendiary shell than one to carry a powerful charge of high explosives, may properly be left for future consideration.

It is recommended that this series of trials be carried out at Sandy Hook, except the trials with shells buried in the earth, which should be made at Fort Wadsworth or Fort Hamilton, where it may be found most convenient to obtain suitable soil. The work should be done under the direction of the Ordnance Department, the Board or some of its members visiting the ground from time to time to thoroughly understand the progress made and to witness the more important experiments.

Respectfully submitted.

HENRY L. ABBOT,
Colonel of Engineers, Brevet Brigadier-General.
A. MORDECAI,
Lieutenant-Colonel, Ordnance Department.

Maj. Gen. JOHN M. SCHOFIELD,
President Board of Ordnance and Fortification.

EXPERIMENTS WITH HIGH EXPLOSIVES.

NEW YORK CITY, *October 12, 1891.*

GENERAL: In compliance with the resolution of the Board at its last session, the committee on high explosives has the honor to submit the following report upon the work accomplished during the seasons of 1890 and 1891, with recommendations for the further prosecution of the trials.

The trials were conducted under the direction of the Chief of Ordinance, and usually in the presence of both members of the committee. The reports herewith of Col. Mordecai, Capt. Shaler, and Capt. Heath supply all needful details, and the following table presents a consolidated abstract so arranged as to render discussion easy. The first trial was made on August 20, 1890, and the last on September 12, 1891.

The general scope of the investigation undertaken by the Board is sufficiently set forth in the preliminary report of this committee, dated June 5, 1889. Unexpected delays in obtaining materials for the projected trials have occurred, and thus far experiments have been restricted to heads (1), (2), and (4), and indeed chiefly to head (2) of that report. Their character is thus stated:

> To test whether an explosion of the first order, or detonation, is assured with the different modes of loading proposed by the inventors, it is proposed to explode duplicate sets of cast iron-shells like those shown on page 229, Report of the Chief of Ordnance for 1884 (caliber, 8-inch; cavity, 5 inches in diameter and 10 inches deep; capacity, about 192 cubic inches, or 6.9 pounds of water). One set to be charged precisely as proposed by the inventor; the other to contain the same amount of the explosive in a compact mass with the rest of the cavity sand-filled. The projectiles will be placed at the bottom of holes about 8 inches in diameter and 4 or 5 feet deep, bored in uniform clay and tamped with sand. From the measured crater radii after the explosion it is believed that a fair idea can be formed as to whether the loading devices reduce the order of the explosion.

The trials were made near the old redoubt at Fort Hamilton. The measurements of crater radii were made with accuracy, the border being defined by the broken edges of the turf which covered the site selected. This measurement was assisted by the use of a frame of radial arms, made of wood and placed by range flags exactly over the hole occupied by the shell. Eight radii were thus measured and recorded, the mean appearing in the table below and the single measurements in the detailed reports. As the cavity of the shell was in all cases filled, as nearly as practicable, the number of pounds of the explosive used affords an approximate clue to the density of loading allowed by the different modes proposed by the inventors.

The formula used in the analysis is the usual expression for land mines, the coefficient, $\frac{1}{17}$, being derived from certain recorded English experiments with high explosives fired in subterra shells, together with the preliminary trial marked No. 1 in the table. This formula is the following, in which C denotes the charge of explosive gelatine in pounds; L, the length of the line of least resistance in feet; and R, the crater radius in feet. The sign of (R-L) in the second member must be carefully noted.

$$C = \frac{1}{17}\left(L + \frac{7}{8}(R - L)\right)^3$$

The accuracy of this formula is attested by the fifth, sixth, seventh, eighth, and ninth trials, none of which were used in deriving the coefficient. The percentage of error shown by these trials is respectively, -1, $+2$, $+0.5$, -2, and $+4.4$ per cent. These are the only

direct comparisons made, but they are deemed sufficient to establish the general accuracy for charges of 10 pounds or less.

Another matter in this connection demands attention. The energy developed by an explosion is expended (1) upon the iron shell, and (2) in the formation of a crater. The latter only can be measured. In the intercomparison of different charges and different explosives it therefore becomes important to determine the relative, and as nearly as may be, the absolute values of (1) and (2), expressed in pounds, of explosive gelatine required to do the work.

With this object in view four trials (Nos. 30, 31, 32, and 33) were made to compare the crater-forming power of 10 pounds of explosive gelatine contained in light tin cans (offering no sensible resistance) with that exhibited when contained in the cast-iron shells adopted for these trials. The figures in the table below show that trial No. 31 differed widely from the other three, suggesting some error in estimating the exact boundary of the crater in that case. Applying Pierce's criterion for the rejection of doubtful observations, this record is thrown out, leaving as the means of the other three 10.39 pounds, with a probable error of 0.14 pounds. Hence the crater-forming charge, 10 pounds, fired in a tin can is the equivalent of 10.4 pounds fired in the standard cast-iron shell. In other words, rather less than 4 per cent of the energy developed by the explosion of 10 pounds of explosive gelatine is absorbed in the destruction of the shell envelope, thus escaping measurement in the crater formed by the explosion. As this measured part is so small absolutely, and as it affects probably to a nearly equal amount all the comparative measurements and the computations based thereon, it may safely be neglected in the discussion of the following table:

No. of trial.	Explosive (with per cent of camphor).	Mode of packing.	Charge.	Line of least resistance.	Observed crater radius.	Explosive gelatine by formula.	Average.
			Pounds.	*Feet.*	*Feet.*	*Pounds.*	
1	Explosive gelatine, 2 per cent	None	10.0	7.0	4.90	8.08	
2	do	Stevens' damp	10.0	4.8	5.13	7.76	
3	Explosive gelatine, 4 per cent	do	10.0	4.8	5.14	7.81	7.81
4	do	do	10.0	4.8	5.15	7.85	
5	do	None	10.0	4.8	5.62	9.89	
6	Explosive gelatine, 2 per cent	do	10.0	4.85	5.68	10.22	10.06
7	Explosive gelatine, 4 per cent	do	10.0	4.8	5.66	10.06	
8	do	do	7.69	4.825	5.07	7.58	7.78
9	do	do	7.69	4.8	5.20	8.03	
10	do	Graydon	7.70	4.8	None.	Burned.	
11	do	do	7.70	4.8	do	do	
27	do	Graydon modified	6.78	4.86	do	do	
12	Emmensite	None	9.81	4.75	4.63	5.90	
13	do	do	9.81	4.7	4.75	6.27	5.49
14	do	do	9.81	4.8	4.09	4.30	
15	Walsrode wet gun cotton	do	6.1	4.7	2.90	2.62	
16	do	do	6.23	3.875	3.97	3.65	
19	do	do	6.23	3.825	3.93	3.54	3.19
20	do	do	6.23	3.875	3.67	2.97	
17	do	C. wax and Paraffine	6.20	3.8	3.10	1.91	
18	do	do	6.26	3.8	3.83	3.28	
21	do	do	6.23	3.875	3.97	3.65	3.14
22	do	do	6.23	3.9	4.00	3.74	
23	Rackarock	None	12.06	4.875	5.69	10.29	
24	do	do	12.0	4.875	5.50	9.38	
25	do	do	12.03	4.85	5.32	8.56	9.41
26	do	do	12.0	4.8	5.52	9.42	
28	Explosive gelatine, 4 per cent	In tin can	10.0	4.8	None.	Burned.	
29	do	do	10.0	4.8	do	do	
30	do	do	10.0	4.65	5.81	10.63	
31	do	do	10.0	4.71	6.69	*15.71	10.39
32	do	do	10.0	4.76	5.80	10.73	
33	do	do	10.0	5.18	5.54	9.82	
34	do	Longitud. diaph.	10.0	4.75	5.95	11.48	
35	do	do	10.0	4.75	5.58	9.26	9.70
36	do	do	10.0	4.90	5.26	8.37	

* *Reject.*

No. of trial.	Explosive (with per cent of camphor).	Mode of packing.	Charge.	Line of least resistance.	Observed crater radius.	Explosive gelatine by formula.	Average.
			Pounds.	*Feet.*	*Feet.*	*Pounds.*	
37	Explosive gelatine, 4 per cent.	Transverse diaph	10.0	4.85	5.38	8.81	9.73
38	do	do	10.0	4.80	5.64	9.95	
39	do	do	10.0	4.90	5.72	10.44	
40	do	Long. and trans. diaph	10.0	4.88	5.31	8.56	9.96
41	do	do	10.0	4.85	5.90	11.48	
42	do	do	10.0	4.85	5.98	11.71	
43	do	do	10.0	4.90	5.20	8.08	
44	do	Stevens' dry	10.0	4.85	5.25	8.27	8.87
45	do	do	10.0	4.86	5.39	8.86	
46	do	do	10.0	4.85	5.52	9.47	
47	German smokeless	None	6.0	4.85	0.8±	(*)	
48	do	do	6.0	2.9	3.29	2.0±	
49	United States rifle powder	do	7.5	4.8	2.69	1.51	1.93
50	do	do	7.5	2.9	3.49	2.35	
51	Perunite B	do	12.38	5.925	6.86	18.04	17.59
52	do	do	12.06	5.8	6.75	17.14	
53	Perunite C	do	12.47	4.9	6.60	15.42	15.47
54	do	do	11.81	5.825	6.50	15.53	
55	Perunite D	do	9.19	4.85	5.69	10.28	

* Camouflet.

Proceeding now to the analysis of the results of the trials, each special object will be considered in turn.

THE STEVENS PACKING.

Not made public, at request of Mr. Stevens.

* * * * * * *

In view of the foregoing, and of the trials already made at the United States proving ground with Mr. Stevens's shell fired from guns, the committee does not recommend any further experiments with his method of packing, until it has been tested on the rotating machine.

THE GRAYDON PACKING.

The whole interior of the shell was lined with a layer of asbestos paper, 0.25 of an inch thick. The explosive charge was separated between three compartments, one hemispherical and two cylindrical in form, by two brass disks placed at right angles to the axis of the shell. These disks were 0.09 of an inch thick, and were pierced by many holes. They were supported by a central brass tube, which was half an inch in diameter, 8.25 inches long, and 0.063 of an inch thick. It was pierced with fifty-six small holes opening into the two cylindrical compartments. This tube contained at trial No. 10 a priming charge of about 225 grains of rifle powder, ignited by an electric primer charged with 4 grains of mercuric fulminate, placed at one end. In trial No. 11 the priming charge was about 197 grains of rifle powder, ignited by an electric primer placed at one end and charged with 24 grains of mercuric fulminate. The total weight of asbestos was about 1.5 pounds, and of the brass parts 1.1 pounds. The explosive charge (explosive gelatine) was made in pellets about an inch long and half an inch square, wrapped in light manilla paper, with the ends folded and the whole coated with paraffine. The entire cavity of the shell was filled. The loading was done by Capt. Judson, representing the company.

As shown by the foregoing table, both of these charges failed to detonate, but burned with a strong flame, giving off nitrous fumes and white and later bluish smoke that cleared the hole of the sand tamping,

but created no crater. The cast-iron shell was fractured, and a small cavity from 26 to 29 inches in diameter was formed in the earth about it.

At the twenty-seventh trial this packing was modified as follows, by Capt. Judson: The asbestos lining was retained, but the tube and disks were replaced by a double tube of tin. The inner of these tubes contained the priming charge of rifle powder, ignited by a 24-grain mercuric fulminate primer; the outer tube was designed to delay the explosion when fired from a gun by allowing the inner tube, held in position by a spring, to move forward and explode a cap at impact with the target. This mechanism represented the kind of fuse proposed by the company for use in shell firing. The result of the experiment was the same as before. The charge burned but did not detonate.

These trials have satisfied your committee that this mode of packing shells with high explosives can not be trusted to secure an explosion of the first order unless the explosive be of a dangerously sensitive character, and therefore that no trial of the device should be made from guns.

TRIALS WITH EMMENSITE.

No packing was used, none being deemed necessary by the inventor when this explosive is fired from guns. Dr. Emmens was represented by his son and his agent, Mr. Strong. These gentlemen loaded the shells, ramming the Emmensite to a solid mass with the handle of a pickax, without care to avoid shocks.

The grade of Emmensite used in these experiments is that known as No. 259. It has a pale yellow color and a strong smell of nitrobenzol. It was stated to contain picric acid, dinitro-benzene, ammonium nitrate, and sodium nitrate. It was packed in paraffined paper and inclosed in tin cans, but exhibited a tendency to cake. This grade is designed specially for military use, being unnecessarily expensive for ordinary blasting.

The subterra trials with Emmensite were chiefly designed to afford data for judging of the relative energy developed by this and other high explosives. The following results were obtained: A charge of 9.81 pounds of the grade tested proved, in three trials, to be equally effective in moving the earth above the charge as 5.9 pounds, 6.27 pounds, and 4.30 pounds of explosive gelatine, respectively. These figures indicate considerable variations in the strength of the different charges, but if we may adopt the mean, or 5.49 pounds, as the true equivalent, the desired ratio is $\frac{5.49}{9.81}$, or 0.56 of the power of explosive gelatine (0.80 of that of dynamite No. 1).

These figures indicate that this explosive ranks with gun cotton in explosive energy, while the rough handling to which it may be safely subjected, and the favorable results already obtained in small guns by Maj. McKee, led the committee to place it at the head of the list for trial in shells fired from cannon. The first three shells received from the manufacturers were therefore devoted to this purpose, and on July 22, 1891, they were successfully fired at Sandy Hook. The gun was a 7-inch Ames muzzle-loading rifle. The propelling charges were 23, 23, and 25 pounds of Dupont's hexagonal E. V. K. powder. The shells contained 8.4 pounds, 7.6 pounds, and 7.4 pounds of Emmensite No. 259, respectively, their total weight being about 135.5 pounds. The elevation was uniformly 11°. The pressure in the bore, determined subsequently by duplicate shots, was about 30,000 pounds per square inch, and the initial velocity about 1,420 feet per second. The shells contained no

fuses and they all fell in the water at long ranges without exploding, thus resisting successfully both the initial shot in the bore and all the effects of rotation due to the rifling. Emmensite is evidently worthy of further trials so soon as suitable larger shells for the purpose are available.

TRIALS WITH WET GUN COTTON.

The object of these trials was to determine how much, if any, loss in explosive energy is caused by the method of packing the charge with paraffine and Carnauba wax, in the manner adopted by Germany and Italy.

Four shells were fired loaded with 6 pounds of Walsrode wet gun cotton, ignited by a 24-grain mercuric-fulminate primer bedded in from 0.10 to 0.23 pounds of dry gun cotton. Detonation occurred in each case, showing that the charge exerted equal earth-lifting force with 3.19 pounds of explosive gelatine. Four other shells were then fired loaded with 6 pounds of wet gun cotton packed with 1.5 pounds of paraffine and 1.5 pounds of Carnauba wax, melted together and filling the interstices of the charge; detonation was obtained by a 24-grain mercuric-fulminate primer bedded in 0.23 pounds of dry gun cotton and placed at the end of the charge. The mean earth-lifting force developed was equivalent to that of 3.15 pounds of explosive gelatine, showing by comparison with the above that no sensible loss of energy resulted from the mode of packing. A direct comparison of the mean crater radii—3.62 feet and 3.74 feet, respectively—suggests the same conclusion, which may thus be regarded as established.

These eight trials also denote that wet gun cotton (15 per cent of water) has $\frac{3.17}{6.21}=0.51$ of the explosive energy of explosive gelatine; or 0.73 of that of dynamite No. 1. Gen. Abbot's ratio for charges of dry gun cotton fired under water at Willets Point is 0.87, which corrected for 15 per cent of water in the charge becomes 0.74, to compare with the above.

Experiments were made to determine the amount of the loss of water from evaporation to which Walsrode wet gun cotton is subject when removed from the sealed metallic packing cases and exposed to dry air. A charge of 49.755 grams said to contain 15 per cent of water was thus exposed with the following result: Total loss in one day, 4.075 grams; in three days 6.945 grams; in four days, 7.345 grams; in six days, 7.485 grams; in ten days, 7.545 grams. As the reported amount of water was only 7.46 grams originally, and as this sample had been removed from a sealed can and kept in a damp place for eight days before this measurement was made, these figures demonstrate that Walsrode wet gun cotton must be kept sealed, or loaded in air-tight shells, to retain the moisture.

As the trials above reported indicate that this mode of packing with paraffine and Carnauba wax does not cause a loss of explosive energy when shells are loaded with wet gun cotton, and as the explosive has been used by Germany and by Italy as suitable for this purpose, an early trial in shells fired from guns is recommended.

TRIALS WITH RACKAROCK.

Messrs. Gillespie and Brouchaud propose to use this explosive in shells fired from powder guns, the dinitro-benzol being contained in a glass receptacle bedded in the potassium chlorate and broken by the shock

separated by diaphragms, a matter which had been overlooked in the Graydon method of packing.

Using the standard shell, this was accomplished in the following manner: (*a*) "The interior was divided into four longitudinal compartments by two plates of sheet iron, No. 18 wire gauge, galvanized, cut into one another at right angles and soldered. The partitions terminated 2 inches below the top of the upper end of the shell buried vertically;" here the detonating fuse (24 grains mercuric fulminate) was placed. (*b*) "The interior was divided into three compartments by means of two circular plates of sheet iron, No. 18 wire gauge, galvanized, of the exact diameter of the interior of the shell; these plates rested upon cylinders of the same metal, which fitted close to the shell cavity, and whose length was so regulated as to cause the plates to divide the cavity into three compartments of equal length. Each of the diaphragm plates was pierced with twenty-four holes one-eighth of an inch in diameter." The detonating fuse (24 grains mercuric fulminate) was in the upper compartment of the shell buried vertically. (*c*) "The interior was divided into twelve compartments, with an open 2-inch space at the upper end of the shell buried vertically, by combining the longitudinal with the transverse diaphragms, previously employed separately. Two circular plates of sheet iron, No. 18 wire gauge, galvanized, each pierced with twenty-three holes one-eighth of an inch in diameter, divided the shell cavity into spaces 4.5 inches long; these plates, instead of resting upon rings, were supported by two pieces of sheet iron, No. 18 wire gauge, galvanized, cut into each other at right angles, which subdivided the space under each circular plate into four equal compartments. The space above the second plate was divided by similar crossed pieces, only 2.4 inches long, thus leaving an open 2-inch space which communicated directly with the four small subdivisions." In this upper space the detonating fuse (24 grains mercuric fulminate) was placed.

The results of three trials each with (*a*) and (*b*) and of four trials with (*c*) are given in the foregoing table (No. 34 to No. 43, inclusive). Although somewhat variable among themselves, none are thrown out by Pierce's criterion; and the means indicate a loss of 3 per cent for (*a*), 2.7 per cent for (*b*), and 0.4 per cent for (*c*). These are quite within the probable error of the determinations, and warrant the conclusion that the diaphragm in no sensible degree lessened the explosive energy developed. The committee, therefore, recommend an early trial from powder guns of explosive gelatine in shell embodying the principles of device (*c*).

GERMAN SMOKELESS AND RIFLE POWDERS.

Four subterra shells were fired to compare the effects of black powder with that of high explosives, and to determine whether confinement and a detonating fuse (24 grains mercuric fulminate) would induce detonation in the sample of German smokeless powder imported for trial in the 8-inch breech-loading rifled gun at Sandy Hook. The results appear in the above table (No. 47 to No. 50, inclusive). They suggest the following conclusions:

Nothing in the nature of detonation occurred with the German smokeless powder. Burning grains were thrown high in the air, and many partially burned grains were recovered in and around the crater. No estimate of the weight of the explosive actually consumed was possible, and hence no precise comparison with the other explosives can be made; but it will be noted that the work, as measured by the two

craters, is less than, but not very unlike, that performed by the two corresponding charges of United States rifle powder having the same volume.

There is no reason to suppose that the black powder (United States rifle) failed to fully burn; and its strength as compared with explosive gelatine for work of this nature (crater-forming) would, therefore, be indicated approximately by the ratio $\frac{1.93}{7.5}=0.26$ if it could be assumed that the energy expended upon the shell itself is the same with both explosives. But this assumption is inadmissible since the iron fragments are much less disrupted by the charge of black powder. The limit of this ratio, however, may be computed from the experiments already discussed, showing that about 0.4 of a pound of explosive gelatine is expended in disrupting the shell itself. If no work whatever were thus expended by the powder, the ratio would become $\frac{1.93-0.4}{7.5}=0.20$.

In other words, these experiments indicate that, for forming shell-craters in earth, explosive gelatine, pound for pound, is more than four times and less than five times as effective as United States rifle powder. Its greater density of loading, as 10 to 7.5, still further adds to this marked superiority for such work.

TRIALS WITH PERUNITE (TERRORITE).

The samples tested were prepared by the inventor, Prof. Mendeleff, who with his assistant, Mr. Gerdes, was present at the trials, to represent the California Explosive Company. The desirable features of two patents (perunite and terrorite) were combined in the explosives as presented, which Prof. Mendeleff stated represented the best for the military service which could be submitted by the company. The samples were four in number, marked A, B, C, and D.

Sample A was prepared in California. To 80 volumes of nitroglycerine, purified as described in his patent (sp. gr. 1.6), is added 10 volumes of nitroethyl (sp. gr. 0.60) and 10 volumes of nitromethyl (sp. gr. 0.789). The compound (sp. gr. 1.4) is a clear, colorless liquid and must be kept tightly corked.

Sample B was prepared at Fort Hamilton by adding 8 per cent of specially prepared pyroxiline to sample A and allowing it to dissolve at the temperature of the air. This action could have been expedited by the use of an air pump. A trace (2 grains to the half gallon) of red aniline dye was added to aid in detecting leakages and spillings. The explosive thus prepared was a fluid not of homogeneous density; in pouring from a bottle it ran sometimes like thick oil; at other times it appeared to clog; again it flowed freely almost like water, although this occurred rarely. It was stated that sample B can be exploded with an ordinary powder cartridge, and that it was believed to be stronger than either C or D.

Sample C was also prepared at Fort Hamilton by adding 12 per cent of specially prepared pyroxiline, 2 per cent of camphor, and a trace of aniline dye to sample A, and allowing the materials to thicken at the temperature of the air. The use of an air pump would have reduced the time required. This sample was more pasty than B, but it showed traces of pyroxiline not fully dissolved, and when removed from the cool magazine it became decidedly more fluid. It was loaded in the shells by pouring, moving like thick honey with wax floating therein.

It was stated that this sample requires a detonating primer to cause proper action, and that it is believed to be stronger than sample D.

Sample D was also prepared at Fort Hamilton by adding 24 per cent of specially prepared pyroxiline, with a trace of aniline dye, to sample A. An air pump had been procured and was used to assist the dissolution. The result was a semifluid jelly which flowed quite sluggishly from the jar, but was loaded in this manner.

In all forms this explosive must be kept carefully corked, as exposure to the air induces evaporation of the more volatile ingredients, leaving a dry residue which exhibits much more sensitiveness. This fact was stated by Prof. Mendeleff, and was verified for sample C by the committee. He also stated that an alcoholic solution of caustic potash should be used for cleaning the jars, etc., as it causes a safe chemical reaction, the results being glycerine and potassium nitrate.

Several days were required for the preparation of a few pounds of the last three samples from sample A; but as the facilities at the fort were not well adapted for such work, and especially as an air pump was wanting until nearly the end of the trials, no estimate of the time required for making these explosives can be based on this experience.

None of the samples presented by the company were as free from the objection of fluidity as the board had anticipated from the correspondence; and sample A was absolutely rejected on account of this defect which certainly would exclude it from the military service. Samples B and C were objectionable on the same ground, but to a less degree; sample D was prepared at the request of the committee to overcome this defect as far as possible. The inventor explained that in the solid form the sensitiveness of his explosive would increase to a dangerous degree, and that a semifluid jelly marked the safe limit in this respect. The volatile nature of some of the ingredients is another serious objection for the military service.

The relative strength of samples B, C, and D, compared with other explosives, was tested in the usual manner in the five trials numbered 51 to 55 in the table. They indicate that perunite takes rank as decidedly the most powerful explosive thus far tested, the ratios, compared with explosive gelatine, being: For sample B, $\frac{17.59}{12.22}=1.44$; for sample C, $\frac{15.47}{12.14}=1.28$; and for sample D, $\frac{10.28}{9.19}=1.12$. How much of this extraordinary power is due to the physical condition of the explosive and how much to the chemical reactions can not be inferred from these trials.

This new explosive is evidently of great interest from a scientific point of view, but so long as it can be produced only in a form possessing more or less fluidity it is unsuited for the military service, and no further trial of it is recommended.

RECAPITULATIONS AND RECOMMENDATIONS.

Summing up the above, your committee recommends: (1) That experiments with Emmensite in shells fired from powder guns be conducted in the 11-inch gun at as early a day as practicable; (2) that similar trials with shells charged with wet gun cotton packed with paraffine and Carnauba wax be prosecuted without loss of time; (3) that trials in the 7-inch gun be made with explosive gelatine in shells diaphragmed on the principles embodied in pattern (*c*) already tested in earth; (4) that early experiments on the rotating machine be made

with rackarock having the ingredients mixed; and that if the results are favorable the trials be continued in shells fired from powder guns.

Sufficient progress has been made in these subterra trials to warrant a classification of the explosives, already tested, according to their relative merit in shells designed to form craters in earthen parapets—upon the assumption (by no means established) that modes can be devised for firing them safely without reducing their natural density of loading. This relative merit is shown by the product of their relative earth-lifting power, as above determined, by their weights when charged in the standard shell cavity (192 cubic inches). These figures of course are chiefly of practical value as indicating in what direction experiments should be pushed. They are the following:

Perunite B	1.44×12.2=17.57
Perunite C	1.28×12.2=15.61
Perunite D	1.12×12.2=13.66
Explosive gelatine	1.00×10.0=10.00
Rackarock	0.78×12.0= 9.36
Emmensite	0.56× 9.8= 5.49
Gun cotton	0.51× 6.2= 3.16
United States rifle powder	0.23× 7.5= 1.72

The following programme is suggested for the continuation of the trials in the early future:

With subterra shells.—Such tests as may be needed from time to time to determine the merits of any new explosive or new modes of charging which may be approved for trial by the board.

With the rotating machine.—A sufficient number of trials to determine whether the danger of premature explosion is to be apprehended from the rotation caused by the rifling when shells thus charged are fired from powder guns: (1) With explosive gelatine in shells having longitudinal and transverse diaphragms combined; (2) in shells without diaphragms containing wet gun cotton packed with paraffine and Carnauba wax; (3) in similar shells containing Emmensite; (4) in similar shells containing rackarock mixed; and (5) in similar shells containing explosive gelatine packed according to the Stevens method.

With the 7-inch muzzle-loading rifle.—(*a*) Ten shells, with diaphragms as above, loaded with explosive gelatine containing 4 per cent of camphor. Firing to be over water, with propelling charges of about 25 pounds of Dupont's hexagonal E. V. K. powder, or its equivalent, with an elevation of about 11°, and without a fuse. (*b*) Five shells, without diaphragms, charged with wet gun cotton packed with paraffine and Carnauba wax, under similar conditions. (*c*) If previously successful on the rotating machine, five charges of rackarock with ingredients mixed.

With the 11-inch muzzle-loading rifle.—Ten shells to be fired loaded with Emmensite, ten more loaded with wet gun cotton, and ten with explosive gelatine, when these explosives have passed a successful test in the 7-inch rifle. The charge in all cases to be regulated to give as severe a shock and as high an initial velocity as the gun will bear; no fuses to be used; the range to be over water, and the firing to be done at rather high angles of elevation.

Fuses with shells charged with high explosives.—It is regarded by the committee as extremely important to prosecute the trials recommended in the first report so soon as samples can be procured.

Remarks.—In order to carry out this programme special shell must be provided for use in the rotating machine. It is thought that when diaphragms are to be used the shell should have octagonal cavities, and that the others should be cylindrical in form. In all of them the rough-

ness of the interior surface should correspond to that of the ordinary service shell. In order to determine the advantageous thickness of diaphragm, several different thicknesses should be tried with charges of dry sand. Two shells for diaphragms and three without them will probably be sufficient.

As Emmensite has already been tried in the 7-inch and smaller guns, its test in the 11-inch gun can be proceeded with at once. The other trials in the 11-inch gun should follow corresponding trials in the 7-inch gun and on the rotating machine.

In the conduct of these experiments discretion must be used in making a greater or less number of trials, without too rigid an adherence to the programme as laid down.

Respectfully submitted.

HENRY L. ABBOT,
Colonel of Engineers,
Brevet Brigadier General, U. S. Army.
A. MORDECAI,
Colonel, Ordnance Department, U. S. Army.

Maj. Gen. JOHN M. SCHOFIELD,
President Board of Ordnance and Fortification.

Appendix F.

SITES FOR PROVING GROUNDS.

[House Ex. Doc. No. 148, Fifty-first Congress, first session.]

TESTING AND PROVING HEAVY ORDNANCE.

LETTER FROM THE SECRETARY OF WAR, TRANSMITTING A REPORT OF THE BOARD OF ORDNANCE AND FORTIFICATION RELATIVE TO A SITE FOR TESTING AND PROVING HEAVY ORDNANCE.

WAR DEPARTMENT,
Washington City, January 22, 1890.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES:

The Secretary of War has the honor to transmit to Congress the report of the Board of Ordnance and Fortification, dated January 18, 1890, and accompanying papers, made in compliance with so much of the act making appropriations for the support of the Army for the fiscal year ending June 30, 1890 (25 Stat., 833) as requires an examination and report "upon a site or sites for ordnance testing and proving ground to be used in the testing and proving of heavy ordnance, having in view in the selection of said site or sites their accessibility by land and water, means of transportation, and suitability for the purpose intended, and also the actual and reasonable cost, and the value of the land embraced in said site or sites, and the least sum for which the same can be procured."

REDFIELD PROCTOR,
Secretary of War.

BOARD OF ORDNANCE AND FORTIFICATION,
WAR DEPARTMENT,
Washington, D. C., January 18, 1890.

SIR: As directed by the act of Congress making appropriations for the support of the Army for the fiscal year ending June 30, 1890, and for other purposes, the Board of Ordnance and Fortification has made an examination of "a site or sites for ordnance testing and proving ground to be used in the testing and proving of heavy ordnance, having in view in the selection of said site or sites their accessibility by land and water, means of transportation, and suitability for the purpose

intended, and also the actual and reasonable cost, and the value of the land embraced in said site or sites, and the least sum for which the same can be procured;" and has now the honor to submit the following report thereon.

The work to be done at an ordnance testing and proving ground is of two distinct classes, which if necessary may be performed at two different sites. Thus every gun, before issue for service, must be fired a few times to verify the perfection of the breech mechanism and the proper adjustment of the several parts of which it is composed. This is simply to prove the guns when fired with service charges, and can be done at any site that fulfills the following conditions:

(*a*) It should be in the near vicinity of the gun factory, with ready means of intercommunication. This would reduce the loss of time and cost of transfers to a minimum, and would enable slight corrections to be made in the same shops and by the same workmen who have fabricated the guns.

(*b*) The area must be large enough, when provided with suitable butts, to guard against accidents which may be caused in the neighborhood by projectiles escaping from control.

(*c*) Sufficient space should intervene between the firing point and private establishments, to prevent the noise from being an annoyance to the population. As the distance between the guns and the butts will always be limited to a few hundred yards, an extensive tract is not necessary for this purpose; an area of about 4 square miles, in approximately a circular shape, will, if situated in a sparsely-populated district, fulfill the requirements.

The other class of work for which an ordnance proving ground is necessary is of entirely a different character. It comprises a thorough and exhaustive test of new types of guns, new carriages on which to mount them, new explosives, new fuzes and igniting mechanism, armor plates of new types and samples delivered for test by manufacturers, new devices for protecting guns against hostile fire, in a word, the researches demanded by modern progress in developing the countless varieties of new war material.

Doubtless, if it were practicable to combine these two classes of work at a single site, the best solution of the problem of where to select an ordnance proving ground would be reached, but a personal examination of the vicinity of the new gun factory at Watervliet Arsenal has convinced the Board that this can not be done. Two sites are demanded for efficient service.

The following conditions should be fulfilled by a site suited to the general investigations indicated above.

(1) *As to dimensions.*—Unless the tract be separated by water from land in the vicinity, considerable width is needful to avoid danger to surrounding property. Projectiles are liable to erratic flights, especially after the first graze, and the fragments caused by bursting charges of high explosives in shells scatter over a wide area. Two miles is by no means an excessive estimate for the width required. As to length, certain facts are to be considered. By far the greater part of the firing will be at comparatively short ranges; for such ranges are best adapted to the determination of initial velocity and accuracy of flight and to testing armor plates and new types of fortification. It is true that projectiles now have a flight of 10 miles and upward, but these extreme ranges can be computed by modern improved methods with sufficient accuracy to meet most practical demands. To throw light upon this important matter of the length needful for a modern proving

this condition more imperative than heretofore, and any site not possessing such a sheet of water should now be rejected as fatally defective.

(3) *As to surroundings.*—The proving ground should be situated at an absolutely safe distance from towns, villages, pleasure resorts, and agricultural districts, present or prospective, but it should also be easily accessible both by rail and by water from general workshops and depots of supply. The water route and a good local harbor where large vessels may lie in safety are specially important, since guns and other heavy material must be received and shipped at any time without danger or delay. The site should also be in good protective relations with the general system of coast and frontier defense; otherwise it would be liable to destruction at the outbreak of war, when its use might be of the utmost importance to the country.

(4) *As to climate.*—The site should be healthy, and not subject to extremes of heat or cold, in order that the work may be uninterrupted. Strong winds and fogs which would interfere with firing should not prevail.

(5) *As to cost.*—The location should be chosen where the price of land will not be exorbitant if purchase be necessary.

These conditions, which accord in most particulars with the views of the previous Boards that have considered the subject, have been used as a criterion by which to judge the several sites examined.

SITES FOR PROOF BUTTS.

The Board took into consideration the selection of a suitable site for proof butts for use in connection with the gun-factory at Watervliet Arsenal. Locations were examined as follows:

(1) All land not now occupied by buildings within the limits of the arsenal, especially that portion west of the shops now in process of construction, and upon which there is at present located a small butt for proving field guns. The Board is satisfied that the proof of heavy guns could not be safely or advantageously made within the limits of the arsenal.

(2) South and west of the arsenal grounds. This tract adjacent to the arsenal was found inadequate in extent for the purpose required.

(3) The range of hills immediately west of the arsenal. Two ravines were examined, together with the hills bounding them. Proximity to Albany and West Troy and the cost of land as nearly as could be ascertained were such as to render it inadvisable to purchase in this vicinity, although the ravines with the hills on either side made a good natural location.

(4) West of Albany, south of the New York Central Railroad, from 6 to 12 miles from the capitol building in Albany, lies a tract of sand hills of little value for agricultural or other purposes. It contains but few houses and is but little cultivated. It is gently rolling country, traversed east and west by three roads and north and south by a few roads—all of little importance. The tract is not so distant from Watervliet Arsenal as to render its use impracticable without a separate establishment. The Board deems it necessary, for the sake of isolation and safety, that the proof ground should be 2 miles square, and has selected such a tract and favors its purchase. With a view of ascertaining the probable value, options were obtained over as much of this selection as possible. It is believed that it will be necessary to resort to condemnation to secure this purchase, as the number of owners is so great that propositions to sell could not be obtained from all.

SITES FOR AN ORDNANCE TESTING AND PROVING GROUND.

The Board has made an extended examination of sites on the Atlantic sea-board (see accompanying map) with a view to collecting as full information as possible respecting localities which might be available for the testing and proving of heavy cannon. The results are set forth in the following descriptions, arranged in geographical order from north to south:

(I) *Cape Cod from Plymouth by Provincetown to Nauset Harbor.*—The whole of Cape Cod was examined, although no section of it had been offered for sale.

The natural supply point would be Boston, distant from Plymouth 37 miles and from Provincetown 120 miles.

Transportation by rail from Watervliet Arsenal would be to Boston by the Troy and Boston Railroad and thence by the Old Colony Railroad. The distance to Plymouth is about 240 miles, and to Provincetown 320 miles. Water transportation to either of these extreme points would be possible, but intermediate points on either side of Cape Cod have no suitable harbor.

From Plymouth to Cedarville, about 8 miles south of Manomet Point, the land is so rough and broken as to be entirely unsuited to the purpose even if cleared of timber. From Cedarville to Sandy Neck Light is a narrow beach. The town of Sandwich extends nearly to the water's edge, as do other small towns along the line of the railroad.

From Barnstable to Eastham are stretches of beach, but the towns extend very close to the shore, as indeed is the case everywhere throughout this district. From Eastham to Wellfleet the ocean front is broken by inlets. On the eastern shore of Cape Cod from Cahoon Hollow life-saving station to Nauset Harbor the beach is straight for a distance of 10 miles. Between these limits from Negro Hollow opposite South Village to Nauset Beacons, a distance of 4 miles, extends a level plateau from 1 to 2 miles wide and about 125 feet above the water. It is entirely unoccupied by houses or roads and is unbroken from one end to the other. Water-range facilities would be very good and within the limits above stated, which include the whole grounds suitable for proving ordnance; the land range is perfect. On the other hand, guns could not be landed anywhere in the near vicinity, and the climate is so severe as to seriously interrupt work except during the summer months. Land is here worth about $5 an acre.

From Nauset Beach beacons to Chatham the tract is too narrow to be of any value for testing ordnance.

(II) *Southern coast of Rhode Island, from Watch Hill to Point Judith.*—Point Judith, at the eastern extremity of a straight reach extending to Watch Hill, is situated about 6 miles south of Narragansett Pier, and can be reached only by wagon from Narragansett. If a harbor were made of Point Judith Sound by dredging, guns could be landed within 1½ miles of the natural location of the battery on Point Judith.

Transportation from Watervliet would be by rail to Narragansett Pier, a distance of about 230 miles, or by water to the same point about 325 miles.

The site would be the section between the mail road, which runs about a mile north of the shore line at Quonocontaug Pond, and about 2 miles north of it at Rocky Point, and thence to Point Judith Neck on a southeasterly line. The country rises very gradually from the shore to the mail road, and the coast line is visible throughout its whole extent

from Point Judith. There are several ponds or lakes occupying large portions of the area. For the first 5 miles west from Point Judith the ground lies well for either vertical or horizontal fire; and by going north of Charlestown Pond it would be practicable to obtain targets for vertical fire for 3 miles more without encroaching on the road. Along the coast line for 10 miles is a good location for horizontal fire, except that, the shore being slightly concave, there would be some danger from ricochet. The portion of the ground on Point Judith is somewhat higher than the remainder of the coast line, and is therefore well adapted for batteries and buildings.

The position would require its own defenses, lying as it does without those of Narragansett Bay.

The facilities for land range are quite good and for water range perfect. There are but few houses west of Point Judith in the section named, but the building of cottages from Narragansett Pier is extending toward Point Judith. No roads at present would be interfered with. The climate is well adapted to the purpose, though at times in winter work might be interrupted by high winds.

The average cost of land would be from $400 to $500 an acre, owing to the proximity to Narragansett Pier; and the residents of this watering place would probably object to the location of a proving ground here, and the land will eventually be desired for building purposes.

The district from Quonocontaug Pond westward to Watch Hill is so broken by ponds, and the level strip along the coast is so narrow, as to render it unsuitable for a proving ground; nor is there sufficient of the coast line continuously visible to give the range required. The average cost of land here would be about $150 an acre.

(III) *Fisher's Island.*—This island is situated at the eastern end of Long Island Sound, nearly opposite New London, which is the nearest supply station, and is distant about 9 miles. It is reached by steamer from New London or Stonington. Transportation from Watervliet would be by the Hudson River and Long Island Sound—distance about 285 miles. Railroad transit, if desired, would be to New London and thence by water.

The island has an extreme length of about 6 miles. It varies in width from about a mile near the western end to a narrow neck near the eastern end. A little over a mile from the west end West Harbor cuts the island nearly in two. Opposite the end of the harbor is Prospect Hill, from which point nearly the whole island is visible. The surface is very much broken, although there are several level tracts, and many parts are covered with bowlders of considerable size. Two miles from Prospect Hill are lakes extending nearly from shore to shore.

The battery would naturally be located on Prospect Hill, or some hill still farther to the east, thus reducing the range to 5 miles or less, but the surface is too rough and rocky for good land ranges. Facilities for a water range are excellent.

As to defensive relations, batteries may probably be located on the island in connection with the general protection of the eastern entrance to Long Island Sound.

There are at present several hotels and numerous cottages situated here. To procure complete isolation the whole island would have to be purchased, although a portion of it would meet the needs of the Government for a proving ground. The probable cost can not be definitely stated. The island, except about 200 acres, was, it is understood, purchased a little over a year ago for about $125,000, and is still owned

Association, which does not desire to sell its property. This company has erected on the 160 acres owned by it, buildings worth perhaps $125,000 to $150,000. Land in small lots is offered anywhere on the tract at $100 an acre; and in June, 1888, an option was given for one year to sell 1,000 acres of the most desirable portion, extending from shore to shore across the point, at $50 an acre. The wooded land at the western extremity is of much less value and is worth comparatively little, probably not more than $10 to $15 an acre.

(V) *Northern shore of Long Island from Greenport to Port Jefferson.*—This district is included between the northern shore of Long Island and the county road running at distances varying from half a mile to a mile and a half from the shore. Greenport and Port Jefferson are termini of branches of the Long Island Railroad, and are, respectively, 95 and 58 miles from New York City.

The land is not owned in large sections by any one individual, nor has it been offered to the Board for sale. The only means of reaching sites in this tract would be by a branch from the Long Island Railroad or by water, and for the latter there are few harbor facilities.

Between Greenport and Horton's Point no desirable location exists. From Horton's Point westward the country is more favorable, being a plateau about 100 feet above the sea. On account of intervening points a shore line of only about 4 miles is visible. The main county road, which is much traveled, runs nearly parallel to the coast, and midway between it and the railroad. The land is divided into small farms, and a large proportion is under cultivation. There are buildings to a greater or less extent upon each farm. Southhold Bay is a little over 2 miles distant from Horton's Point, and into it vessels of sufficient draught for the carrying of heavy guns can enter. The distance of Southhold Bay from New York is about 100 miles. If a site were selected, running west from Horton's Point to the Mattituck Hills, the firing point would be located near the light-house. There are ample facilities for water ranges, and a continuous land range up to 4 miles, which can perhaps be increased to 8, although the targets would not be visible from the firing point. A railroad would be required from Southhold Bay. It is regarded as impracticable to divert the county roads to the south of the railroad, so as to prevent travel on the proposed range, and without such diversion the strip of land is too narrow, being in places but a half mile wide.

The location is within the line of the possible defenses of the entrance to Long Island Sound.

The climate is similar to that of New York city, though somewhat cooler in summer.

The land is owned in small farms, and would cost on an average, including improvements, from $80 to $100 an acre. No effort was made by the Board to obtain definite propositions for sale, as the owners were so numerous, and the site was not deemed suitable for the desired purposes.

West of this section, from Young's Point to Herod's Point near Wading River, is another possible site. The continuous range here is less than in the location last mentioned. The country is more broken and in general is not so well adapted to use as a proving ground. Approach by water is much more difficult. The general character of the country is the same, although a less proportion of the land is under cultivation. The same difficulty exists as to county roads and deficient isolation.

The average price of land is about $75 per acre. It is held in small farms.

two or three houses on the tract. The wagon road from Keyport South Amboy and the railroad to Long Branch traverse the site.

The climate is similar to that of New York City.

The probable cost, if the salt marsh were included, was stated by M Rowan to be about $1,000,000.

(VIII) *Site near New Egypt.*—This site, offered for sale by Mr. Fre erick Mead, of New York City, is situated in southern central Ne Jersey, about 2½ miles east of south of New Egypt, the nearest railroa station, on the Pemberton and Hightstown branch of the Pennsylvani Railroad. The nearest supply station is Trenton, New Jersey, or mo directly Philadelphia, which is distant 35 miles.

New Egypt can be reached by railroad from New York, which about 65 miles distant, over the Amboy division of the Pennsylvan Railroad, or from Camden by the same road. A branch road 2½ mil would be needed from New Egypt to the proposed site to make available. It could not be reached directly by water.

Transportation by rail from the gun factory at Watervliet Arsen would be by the Delaware and Hudson Canal Company's road, then by the West Shore to Jersey City, thence by the Pennsylvania Rai road system. The distance to Watervliet is about 215 miles. Tran portation by water and rail would be by water to Bordentown, then by rail. Guns going to sea-coast forts would be transported by rail Bordentown or Camden, thence by water.

The site as first offered is irregular in shape, covering about 17,0 acres. The longest line (not quite 10 miles) is a diagonal from nort west to southeast. The eastern section is covered with sand hill nearly 200 feet above the level of the western portion. The rang would extend to the southeast, the firing point being near Brindl town. Such houses as are on the tract would be of no special value t the Government. Three roads that are somewhat used cross the trac although it is claimed that they could be diverted. The western po tion is extremely flat.

There are no adequate facilities for the testing of ordnance materi in or over water, as the lake at Brindletown is not large enough f such purposes. There is no natural barrier to prevent the crossing the tract or to isolate it.

The climate is similar to the rest of New Jersey—mild in winter an hot in summer. The location is an interior one, not requiring defens against bombardment.

The tract was originally offered for $100,000, but there were som "exceptions" on land sold within the outer boundary. Subsequentl Mr. Mead agreed to add such additional land as would give a range by 10 miles at $10 per acre for the addition; he also offered to secu such "exceptions" as fall within his exterior boundary at the sam price. The price per acre is less than half that offered elsewhere i New Jersey. Land in the neighborhood was held at from $5 to $50 a acre, according to location.

(IX) *The Wharton tract.*—This tract is situated in southern Ne Jersey, the southern extremity being near Egg Harbor City, and th northern about 30 miles from Philadelphia, which is the natural suppl station. The site extends 2 miles along the New Jersey Southern Rai road west of Harris Station. The only direct railway approach fro the north is by this road. It has no facilities for direct water tran portation, Little Egg Harbor River, which runs within a few miles the southern boundary, being hardly available for use. Transport tion by rail from the gun factory at Watervliet Arsenal would be

The cost of clearing and grubbing would be from $15 to $20 per acre and would require renewal from time to time. The land is sufficiently level for proving-ground purposes.

The natural location for the firing point and buildings would be near the northern extremity, permitting a possible land range of over 8 miles. It is uncertain whether targets at one end of such a range could be seen from the other. When inspected by the Board a road parallel to the axial line and a little west of it had been cut through the scrub growth for about 4 miles, and drained by ditches on the sides. The whole extent of this road could be seen from its northern end. There are no facilities for a water range, or for testing any ordnance material in or over water.

Such small buildings as exist at present on the ground would be of no value for Government purposes. The remoteness of the tract from business centers would make the matter of supplies and emergency purchases a source of some trouble.

Three roads in general use cross the tract, one from May's Landing to Millville, one from May's Landing to Cumberland, and one from Hunter's Mill to Cumberland. The first named is the only one much used. Mr. C. G. Patterson, who offers the land for sale, agrees so to divert these roads as to prevent the necessity of transit. There is no natural barrier on any side to secure its isolation.

The climate, like all of interior southern New Jersey, is mild in winter but hot in summer. The mosquitoes would probably interfere with work more than the climate.

The land is offered by Mr. C. G. Patterson for $225,000. Mr. Patterson further agrees to build, free of expense to the United States, a railroad connection from the northern extremity to the West Jersey and Atlantic Railroad at Richland. Estimating the cost of the railroad at $25,000, the price of the tract conveyed would be about $17 an acre. The Board is informed that land has been sold in the neighborhood in small lots at about $20 an acre.

UNITED STATES ORDNANCE PROVING GROUND AT SANDY HOOK, N. J.

The existing proving ground, owned by the Government at Sandy Hook, N. J., is situated at the entrance to the lower bay of New York Harbor; the main channel passes within less than a mile of its northern extremity.

It can be reached from New York, the natural supply point about 20 miles distant, by the Central Railroad of New Jersey or by boat, in from one to two hours.

The Government dock is on the inner shore a few hundred yards from the point of the Hook; this is used exclusively for Government purposes. The railroad company has been permitted to erect a dock on the inner shore about 1½ miles from the first dock, for the accommodation of their steamers, and to this runs their road from points on the Jersey coast.

Transportation from the gun factory at Watervliet Arsenal by water is about 175 miles by the Hudson River and New York Bay. Vessels loaded at the factory deliver direct at the proving ground. By the construction of about 2 miles of railroad at Sandy Hook, deliveries could be made by rail from the factory about 185 miles through the Delaware and Hudson Canal Company's road, the West Shore Railroad, and the Central Railroad of New Jersey.

The distribution of cannon to points on the coast or in the interior can be effected by similar means without second handling.

The result of this exhaustive study of the subject may be summed u as follows: The present ordnance testing and proving ground at Sand Hook, N. J., satisfies the requirements of a site for this purpose muc more nearly than any other available within the limits stated.

The occupation of part of the western shore by the Long Branch an Sea-Shore Railroad, however, has become inadmissible, in view of th extensive use of the range demanded by the resumption of work upo our sea-coast defenses; of the longer range of modern high-power gun over any existing at the date when such occupation was authorized and of the necessity for largely extending the area occupied by th works of permanent defense now projected at Sandy Hook.

The facts connected with the present occupation of the public lan by the railroad in question are fully set forth in House Ex. Doc. No 166, Forty-first Congress, second session. Authority to construct road to a designated point near "The Cove" was granted by Presiden Lincoln on July 21, 1864; and this permission was extended to "Th Horse Shoe" by the Secretary of War on August 10, 1869. Since thes dates the circumstances have been materially changed by the cause above stated.

The Board, therefore, recommends that this permission be now with drawn, as may be done without hardship to the company, under th conditions affixed to the original grant. The railroad within the limit of the public land is not at present extensively used, and the Govern ment must either be hampered or the public must be endangered fo the benefit of a private corporation.

While Sandy Hook now affords sufficient facilities for the needs o the Government in the matter of testing and proving heavy guns, it i not impossible that in the future an additional site may become neces sary by reason of the completion of the fortifications at Sandy Hoo and their occupation by a garrison; and for this reason the Board ha had in view the relative advantages and disadvantages of all the site examined, well knowing that the cost will increase, and indeed tha the possibility of securing such a site at any reasonable figure ma become doubtful as time passes.

No site which requires consideration was found along the shores o Cape Cod between Provincetown and Nauset Harbor, as will be seen b consulting the above description of this district.

Near Point Judith a site exists which, except for the excessive cos and proximity to the established summer resorts of Narragansett Pie and vicinity, would require serious consideration; but for these reason it must be regarded as unavailable.

The examination of the northern shore of Long Island from Green port to Port Jefferson and of the west shore of Peconic Bay disclose no site which in any degree fulfills the necessary conditions demande by an ordnance testing and proving ground.

The site near Morgan, N. J., comes under the same category, and th cost under any circumstances would exclude it from consideration.

The three interior sites in New Jersey known as the Mead tract, th Wharton tract, and the Patterson, near Richland, possess similar nat ural features, and are all fatally defective in furnishing no facilities fo water ranges. For this and other reasons, as will appear by comparin the requirements stated above for a suitable site for the object desired with the detailed descriptions of these three tracts, they should be re jected without hesitation. As to their relative merits, compared wit each other, neither of the more southerly sites possess superior adva tages over the Mead tract, which is offered for a very much lower pric

Appendices to report of Board of Ordnance and Fortification on sites for proving gr

A. Abstract of options obtained for grounds for sites.
A[1]. Letter concerning same.
A[2]. Map of same.
B. Report of Gillespie Board. (The Appendices to this report not sent here
C. Report of Greer Board. (The Appendices including maps, etc., to this r
not sent herewith.)
D. Map showing sites examined.

West of the line.

Name.	Acres.	Pri
Dugan	111	$4, 4
Wiltsie	524	3, 7
Charles Coon	514. 60	5, 7
Vandyke	84. 48	3, 8
Charles and G. Coon	217	8, 2
W. T. Capron	32	8
J. Clute	82. 50	8
J. P. Kilmer	136. 10	2, 7
Heaner	100	3, 0
Total	1, 001. 83	33, 2
Average per acre		

The distance to Karner's Station by the railroad guides is 8 miles from Albany miles from West Albany. Except for its being nearer to Albany the land from water-works property to the proposed eastern boundary is better adapted to purposes than that west thereof. Land along the railroad would now proba average from $50 to $75, that between it and the Lydins road probably from $3 $50. The owners would not fix prices.

Very respectfully, your obedient servant,

C. C. MORRISON,
Captain Ordnance Departmen

BOARD OF ORDNANCE AND FORTIFICATION,
Washington.

APPENDIX B.

Preliminary report of a board of officers upon the selection of a suitable locality proving ground and for other purposes, limited to the examination made at Sandy H New Jersey, and Island Beach, New Jersey, constituted by the following order:

Special Orders No. 122.

HDQRS. OF THE ARMY, ADJUTANT-GENERAL'S OFFICE,
Washington, May 26, 188

[Extract.]

* * * * * * *

17. By direction of the Secretary of War a board of officers, to consist of Li Col. George L. Gillespie, Corps of Engineers; Lieut. Col. Richard Loder, Fifth A lery; Capt. Rogers Birnie, jr., Ordnance Department, is appointed to meet at Army Building in New York City on the 2d day of June, 1888, or as soon theres as practicable, for the purpose of determining upon a suitable locality for prov ground, and for other purposes, under such instructions as may be conveyed to board by the Chief of Ordnance. The board will visit such localities in the formance of its duties as may be necessary. On the completion of the duty con plated the officers named will return to their proper stations. Such journeys as be required in complying with this order are necessary for the public service.

* * * * * * *

By command of Lieutenant-General Sheridan.

R. C. DRUM,
Adjutant-Genera

Official:

O. D. GREENE,
Assistant Adjutant-Genera

The letter was accompanied by a letter of instructions herewith, marked "B," pared by the Chief of Ordnance May 31. 1888, inclosing for consideration House olution 156, Fiftieth Congress, first session, amended, herewith, marked "C."

The Board met pursuant to the above order 10 a. m. June 4, all the members p ent. Sandy Hook was visited June 5, and the afternoon of June 6 the Board ceeded to Island Beach, where the examination was completed by the afternoo June 7.

the effects of projectiles intended to defend the coast against the advance of hostile ships of war.

The length of the reservation is 5 miles, nearly. The width of the northern portions averages somewhat over one-half mile, increasing to about 1 mile near the middle length. At the south the land contracts to a narrow neck of sand averaging about 100 yards in width over a length of three-fourths of a mile. This configuration of the land lends itself in a remarkable degree to contribute to the necessary isolation of the locality. The land is nearly level and naturally well graded for general purposes; and ample and suitable space is at hand for the construction of buildings or other works required. The range is located near the ocean beach and the line of fire extends southward; there is a safe and suitable range over land for low-angle firing up to about 4,500 yards, and for mortar or high-angle firing up to about 6,600 yards.

Should it be deemed necessary at any time to supplement the ample facilities for water transportation, it would require the laying of about 1¼ miles of railroad track of easy construction.

ISLAND BEACH.

Island Beach is a long and narrow sand-spit which separates Barnegat Bay from the Atlantic Ocean, on the New Jersey coast, 50 miles south of Sandy Hook. The portion which the United States Hotel Company suggests as a proving ground is 8.2 miles long approximately, and extends from a point near Life-Saving Station No. 13 southward to Barnegat Inlet. It is deficient in many essential features.

"There is no suitable harbor in the vicinity. Not more than 6 or 7 feet can be carried at mean-low water over the bar at Barnegat Inlet, which is described by the United States Coast Survey as follows:

"'It is a little over one-half mile wide at the entrance, but this space is nearly all occupied by dangerous shifting sand-shoals, which extend off to seaward for a distance of nearly 1 mile and render all attempts to enter the inlet extremely hazardous for those who are not competent local pilots.'

"The locality is very inconvenient of access and is entirely destitute of wharves, buildings, emplacements for guns, etc., to provide which would involve a large expenditure." (Report of Board of Engineers for Fortifications hereto appended, marked "D.")

The site is 70 miles distant from New York City and 60 miles from Philadelphia, with which cities it has connection by a single-track railway, which would have to be strengthened at once, especially at bridge crossings, undoubtedly at Government expense, too, to adapt it for the transportation of single weights equaling 54 tons, the maximum weight of a single modern gun built by Government. Barnegat Bay has an average depth of 7 to 8 feet, and the channel is on the west side, 4 miles from Island Beach. It has no value whatever as a harbor for any kind of war vessel. The average width of Island Beach does not exceed 1,400 feet—the minimum width being about 1,000 feet. The surface of the beach north of the head of Barnegat Bay selected by the board of 1875 is comparatively regular and continuous, but Island Beach, from end to end, is distinctively irregular and broken. The dunes are well-marked and distinct hummocks, separated at frequent intervals by broad and deep swales extending directly across the spit from the ocean to the inside bay, furnishing water-ways for the seas which sweep over the beach during extreme high tides or when driven against the shore by strong easterly storms. The trough of these swales is a foot or more below average high water and has generally a bulkhead of 10 to 15 feet thickness separating it from the ocean, while the crests of the hummocks rise to heights above high-water plane varying from 10 to 20 feet. Along the upper part of Island Beach the outer faces of the highest hummocks are close up to the high-water line with a somewhat steep foreshore, but along the lower part they lie well over to the west side, with smaller ones in front in the direction of the ocean, showing a more recent formation.

To fit the beach for a suitable range, as well as a site for targets, platforms for guns and for buildings, the hummocks would have to be graded into the swales and leveled up and protected so as to provide a permanent level 10 to 12 feet above the high tide.

It is impossible to estimate accurately the cost of doing the work, but it will not be at less rate than 16 cents to 20 cents per cubic yard for material moved up to 1,000 feet.

The reduced width of the spit—only 1,000 feet wide at places—makes the site ill adapted to the convenient location of buildings for the service of the station, after making suitable reservation for railway tracks and switches. It is to be remarked, also, that two life-saving stations are located upon Island Beach, which could not safely be occupied by families during firing; that the Beach is not sufficiently long to give the extreme range required on land, and that if the range which could be located on Island Beach could be prolonged to 9 miles from the firing point, its terminus would fall dangerously near the populous settlement south of Barnegat Inlet.

erty from the firings. This feature is secured by the present configuration and peculiar location of the reservation and its limited occupation by outside parties under the rules and regulations established by the Government to prevent trespass; and this feature can only be retained by the Government maintaing the present control of the whole of the reservation. The narrow neck of land, now owned principally by the Government, connecting the Hook with the mainland at the south is a strip of sand difficult of access and traversed only by the railroad which lands no passengers except at the dock on the bay shore. Should the occupation of any portion of the reservation be permitted for hotel purposes, the isolation of the tract would be destroyed. It would be difficult if not impossible to prevent persons from trespassing upon the portions of the beach or land reserved to the Government, and there would be a constant danger to injury from the firings. There would also be the possible danger of the landing of projectiles from erratic flight within the portion ceded for hotel purposes, and the dangerous area would be much increased by the use of the water in front of the ceded area by bathers and boats of various description. The clear sea area at present available makes it feasible and entirely safe, with due care exercised, to fire over-land ranges up to 4,000 or 4,500 yards.

The advantages of retaining Sandy Hook as a proving ground—limited though it may be to ranges up to 4,000 yards overland—taken in connection with such information as the Board has as yet been able to obtain with regard to any other possible site, are such as to lead the Board to express the earnest conviction that such retention is advisable and that any measure looking to the relinquishment of this proving ground at the present would seriously interfere with the operations of the Government.

The accessibility of the place to the establishments that will probably furnish the guns, carriages, armor, and other materials for trial and proof, and its facilities as regards transportation of all this material both from points of supply and to points of final destination are probably superior, in point of means, time and economy to any other possible location.

The Board has elsewhere cited these advantages and also those of the convenient harbor for trials of torpedoes of various kinds, all of which must be operated in navigable waters. It is deemed highly important that a proving ground should afford all necessary facilities for testing water-fuzes used in connection with aërial torpedoes and with projectiles with dangerous bursting charges fired to sea.

A proving ground at this place will be under the direct protection of the forts and batteries which must be erected there for the defense of New York Harbor, in this respect affording a decided advantage over any equally exposed site on the coast which, unless provided with defenses, would be open to easy bombardment by hostile vessels and probably entail an entire abandonment of the site in time of war, and the cost of removal or the destruction of much valuable material.

No expense for such supplementary defenses would be required at Sandy Hook.

The economy to the Government, in the matter of immediate expenditure, in retaining a proving ground at Sandy Hook need scarcely be dwelt upon. But it may be pointed out that there is now a machine shop for repairs, an office building with instruments and appliances fixed for taking velocities, etc., various platforms for guns including two of concrete, targets, sand-butt for proof firing, a substantial brick building for officers' quarters and quarters for foreman and the enlisted men employed at the station, and a Western Union telegraph office and observation tower for sighting vessels: there is a considerable amount of material which would require removal if the proving ground were abandoned and the establishment of a new proving ground would require the renewal of appliances now operative at Sandy Hook.

The sea ranges at Sandy Hook are measured by plane table. Whatever deficiency may have heretofore existed in this respect appears to have been fully met by the recent establishment of one extremity of the measuring base at the Navesink Light. This gives an ample base length to get good and sufficient angles from the sea range.

Upon the question of the expediency of retaining at Sandy Hook a land range up to 4,000 yards; the Board concludes that the present situation at Sandy Hook substantiates the following proposition, viz: There would exist ample facilities for all the firings required on a first-class proving ground except in a few comparatively unimportant particulars; there would be in other words a limited land range of the extent named and an unlimited sea range. An exception noted is that the projectiles fired at long range—necessarily to sea—could not be recovered. On this point, however, the investigations of the Board made at Sandy Hook show that it is difficult and often impracticable to recover projectiles fired on land which sink deep into the sand as in the case of high angle firing. This difficulty would probably be found on any low-lying, sandy, seacoast site, as it appears that at the Barnegat site the sand is found to be saturated with water at a less depth than at Sandy Hook. The extreme ranges of all guns can be determined by firing to sea and if the longest range *firing for* accuracy at vertical targets is required, the target can be floated as is now *done in practice at some* of our artillery posts on the seaboard.

The amount of firing required to be done at a proving ground beyond a range of 4,000 yards is relatively small; hence the importance, in the matter of economy of recovering the projectiles fired beyond that range is not great. Much the larger part of all the firings is done at the proof-butt at very short ranges and the projectiles are recovered from the butt.

The 4,000 yards range over land, which includes several hundred yards more of land lying beyond in the line of fire, will afford scope for all the firings absolutely necessary to be made over land; it is about the extreme range at which siege guns and projectiles need be tested for accuracy, and of course embraces the ranges for field guns. It affords scope also for testing the effect of every caliber of projectiles on earthworks and on armor; the conditions of loading and firing may, as would generally be done even on a more extended range, be made to assimilate the conditions of firing at full ranges with full charges of powder.

The report of the Board on Arsenals, of 1875, page 602, annual report Chief of Ordnance, 1875, made before the establishment of the present proving ground and now referred for the information of this Board, states the following objection with reference to the use of the reservation at Sandy Hook as a proving ground, viz:

* * * "It is entirely too contracted for all our uses, and the Long Branch railroad limits and materially interferes with its usefulness as an experimental firing ground." * * *

The continued use of the place as a proving ground during the past ten years has afforded opportunity to test and determine its facilities and suitableness. It can now be said with full understanding, that the place has proved adequate in the past and affords natural facilities suited to a large expansion of the present work and the maintainance of an excellent proving ground.

G. L. GILLESPIE,
Lieutenant Colonel Engineers.

R. LODOR,
Lieutenant Colonel Fifth Artillery.

R. BIRNIE, Jr.,
Captain Ordnance Department, U. S. Army.

The CHIEF OF ORDNANCE, U. S. ARMY,
Washington, D. C.

APPENDIX C.

Report of the Board of Ordnance Officers convened to select a site for a proving ground by the following orders:

Special Orders, No. 156.

HDQRS. OF THE ARMY, ADJUTANT-GENERAL'S OFFICE,
Washington, July 7, 1888.

[Extract.]

* * * * * * *

2. By direction of the Secretary of War a Board of officers of the Ordnance Department, to consist of Captain Cullen Bryant, Captain John E. Greer, Captain Rogers Birnie, jr., is appointed to meet in New York City on Thursday, July 12, 1888, or as soon thereafter as practicable, for the purpose of selecting a site for a proving ground. The Board will be guided by special instructions to be given by the Chief of Ordnance, and the Board, or the individual members thereof, will make such journeys as may be necessary under such instructions. Upon the completion of the duty contemplated the members of the Board will rejoin their proper stations. The travel enjoined is necessary for the public service.

* * * * * * *

By command of General Sheridan:

R. C. DRUM,
Adjutant-General.

Official.

J. C. KELTON,
Assistant Adjutant-General.

Special Orders, No. 168.

HDQRS. OF THE ARMY, ADJUTANT-GENERAL'S OFFICE, *Washington, July 21, 1888.*

[Extract.]

* * * * * * *

4. By direction of the Secretary of War, Captain Frank Heath, Ordnance Department, is detailed as a member of the Board of Officers appointed by paragraph 2, Special Orders, No. 156, July 7, 1888, from this office, *vice* Captain Cullen Bryant, Ordnance Department, hereby relieved from further duty as a member of said Board.

* * * * * * *

By command of General Sheridan:

R. C. DRUM,
Adjutant-General.

Official:

J. C. KELTON,
Assistant Adjutant-General.

The Board met pursuant to the above orders. The record of its proceedings are herewith appended marked A. On the dates and in the order specified therein, the Board visited and carefully inspected the following named places, proposed as sites for a proving ground, viz:

(1) The valley of the Rockaway River from Berkshire Valley northeast to Petersburgh, N. J.

(2) A tract of land near Richland, N. J.

(3) A tract of land near Elwood. N. J., known as the "Weymouth tract."

(4) The "Montauk tract" at the eastern extremity of Long Island.

(5) A tract of land near Atsion, N. J., known as the "Atsion tract" of the Raleigh Land and Improvement Company.

(6) A tract of land near Albany, N. Y.

And the Board also visited and inspected the present proving ground at Sandy Hook, N. J.

The special instructions of the Chief of Ordnance to the Board, by which it was to be guided, with accompanying papers transmitted therewith, are herewith inclosed marked B^1 to B^6. By these instructions the site selected for a proving ground should fulfill the following requirements:

(1) It should admit of open ranges of from 8 to 10 miles preferably over land.

(2) It should have a width of from 1 to 2 miles, if inland, depending upon location and topographical features.

(3) It should be adapted to the erection of the necessary structures, as shops, offices, and quarters, platforms for heavy guns, of either masonry or timber, railways and roads, telegraph and signal communications.

(4) It should be adapted to the various kinds of fire from field as well as from heavy guns, and to the various tests of projectiles, earthworks, and armor-plates.

(5) It is desirable that it should possess facilities for the test of shell to act under water.

(6) It should be comparatively level, easily accessible, not traversed by important highways or water-courses; remote from settlements to avoid encroachment and danger of accident or damage to private property.

(7) It should have convenient communication with the establishments that will furnish guns, powders, projectiles, etc., for trial and proof, and should possess ample facilities as regards transportation, both by rail and water, from points of supply and to points of final destination.

(8) It should stand in proper protective relation to the system of coast and frontier defense.

The instructions also name the following public and private establishments from which supplies are or have been recently procured, viz: Watertown Arsenal, Watertown, Mass.; Frankfort Arsenal, Philadelphia, Pa.; West Point Foundry, Cold Spring, N. Y.; South Boston Foundry, Boston, Mass., and Dupont's Powder Mills, Wilmington, Del. The Board also deemed it proper to consider that the Cambria Iron Works, Johnstown, Pa.; Bethlehem Iron Works, Bethlehem, Pa., and the Midvale Steel Works, Philadelphia, Pa., are probable sources of supply for guns, projectiles or armor. It is also noted that since the issuance of these instructions a law has been enacted authorizing the erection of the necessary buildings and structures for an army gun factory at Watervliet Arsenal. Finally the Board is required by its instructions to state whether the site or sites it may visit are preferable or otherwise to the present proving ground at Sandy Hook; and if it should find one or more suitable sites to furnish an estimate of the prices for which they can be procured and of the amount necessary to provide adequate means of communication to and from the place, with the great lines of rail and water transportation.

nal point of the range. May's Landing is the head of navigation on the Great Egg Harbor River. Vessels of from 100 to 150 tons ascend to this point.

One important road, the May's Landing and Egg Harbor City, crosses the proposed line of fire at about 4½ miles from Elwood. It is understood, from correspondence with Mr. Colwell, that this road can be vacated. An unused railway runs parallel to it and connects the two towns. From its direction it could not be made of any special value to the United States.

The land is in general quite level. It is covered with pine and cedar, mostly of small second growth, though there is a considerable quantity of large timber still standing, particularly of white cedar. The ground is somewhat cut up by streams with low marshy borders which are especially objectionable as they occur within the portion that would be most frequently used. The soil is a sandy loam and the land is regarded as desirable for farming purposes when the timber is removed.

The chief advantage possessed by this range lies in the fact that it has two competing railways but 200 yards apart at its upper end, and a railway and a small river at the other.

The price asked by Mr. Colwell, $25 per acre, is materially higher than that of another equally good and possibly better range examined by the Board, though the latter has not the advantage of competing roads. Owing to the system of pooling adopted by most railways, this supposed advantage may be entirely illusory. In addition, the practicable range that could be obtained would be materially shorter than the one above referred to as the guns would have to be advanced some little distance from Elwood. The Board does not, therefore, recommend this site as suitable for a proving ground.

ALBANY.

This site is located between the cities of Albany and Schenectady, on the line of the New York Central and Hudson River Railroad. It comprises the greater portion of the high land or divide which separates the valleys of the Hudson and Mohawk Rivers between the two cities named. The soil is principally sand, covered more or less thickly with scrub oak, pine, and huckleberry, with here and there patches of timber of considerable height. A ridge of hills, estimated from 20 to 60 feet high, extend nearly the entire length of the available site, with spurs jutting out at various points, necessitating considerable grading on the line of the proposed range which is marked on the accompanying tracing. The land in the vicinity of Albany is uncultivated and is of little value; towards Schenectady the soil improves, and numerous small farms are to be found in the level portions between the hills. Although the cities named are 17 miles apart, yet owing to the necessity of locating the firing point a sufficient distance from Albany to avoid damage and disturbance to that city, and the fact that in the vicinity of Schenectady important highways exist which can not be closed, the available range would be limited to about 6 miles. This ground is easily and quickly accessible from the Watervliet Arsenal by means of the Delaware and Hudson and New York Central Railroads. The advantages of location due to this fact are evident. The Board, however, on account of its limited range as explained above, does not recommend it as a suitable site for a proving ground.

MONTAUK.

Montauk is situated at the extreme easterly end of Long Island. It is about 10 miles in length, and varies in width from 1 to 3 miles. It rises quite abruptly from Napeague Beach, a low, sandy strip extending from the eastern shore of Napeague Harbor back to the town of Amagansett, a distance of about 5½ miles.

About 2½ miles from the western end of Montauk the land reaches its highest elevation, fully 125 feet or more, and from thence a command is given over the ocean, the sound, and the land itself to the extreme end of Montauk Point, at which the light-house is distinctly visible. A tolerably abrupt descent leads from the high ground to Fort Pond, a sheet of water about 2½ miles from the assumed position of the guns, lying across the proposed line of fire. The land rises almost immediately on the opposite side, and continues in a general level, though over a somewhat rolling country, to Great Pond, where there is a moderate depression, thence on to the light-house. The latter portion is somewhat rough and rocky, particularly along the line of the road which skirts the shore and overlooks the ocean. The soil is a firm admixture of sand, gravel, stone, and earth. The whole area is covered with grass, and is used as a range for cattle and sheep.

Within the limits of the proposed firing ground there are about three buildings, two being keepers' houses and one a stable near Great Pond, except on a bluff overlooking the sea, where nine cottages have recently been erected for summer occupancy. These could not well be utilized by the Government in their present position, as they are only about half a mile from the line of fire. It is possible that they

At present, the nearest towns are Richland, 2½ miles, and Vineland, 7 miles distant from the boundaries of the tract.

It is assumed that the northerly end of this tract would be the proper location for a firing point, and that connection by rail with points of supply, etc., would be made at Richland. The terminal points of the railroad through this valley are Camden and Atlantic City, N. J., both on tide-water; but, owing to the poor harbor entrance and difficult navigation to reach Atlantic City from the ocean, the nearest accessible point for water communication with the site is at Camden, on the Delaware River, 39 miles distant. The West Jersey and Atlantic forms a part of the Pennsylvania Railroad system, and this company has stated to the Board, through one of its agents, that it will undertake to transport from Jersey City or from Camden to Richland a gun weighing 120 tons. A continuous line of railroad without transshipment is afforded from Watervliet Arsenal to Richland, via Albany, Jersey City, and Camden, over the Delaware and Hudson, the West Shore, and Pennsylvania Railroad system. Water communication between Watervliet Arsenal and Camden, sufficient to transport the heaviest guns, is afforded by the Hudson River and the Delaware and Raritan Canal into the Delaware River at Bordentown, thence to Camden. In this connection attention is invited to letter, inclosure H⁴, from the superintendent of the canal company. The facilities for rail communication to Richland are sufficient, but it is entirely destitute of direct water communication; the latter is conveniently accessible only at Camden. For shipments of heavy guns it would be necessary for the Government to provide special railroad trucks. Richland is distant by either rail or water (from Camden) about 280 miles from Watervliet Arsenal.

As stated in inclosures herewith H⁶ 2, 3, and 5, Mr. C. G. Patterson offers to convey this tract of land to the United States, free of all incumbrances in the shape of roads, dwellings, etc., and to include a railway connection between the northerly end of the tract and the West Jersey and Atlantic Railway at Richland, for the sum of $225,000. In this it is understood that the estimated cost of the railway connection is $25,000, which leaves the value of the land $16.16 per acre.

At the time of the visit of the Board the new road, 4 miles in length and the clearing at the northerly end of the tract, mentioned by Mr. Patterson, were nearly completed.

In regard to the selection of this site for a proving ground the Board is of the opinion that if an exclusively land range is to be selected this site is suitable; but the Board would further state its opinion that it is very desirable, if not essential, that a proving ground should afford facilities for tests of various war-like appliances in or over deep water, and in this view of the case the Board does not recommend the Richland site for selection as a proving ground.

SANDY HOOK.

In the preparation of the following description of Sandy Hook, free use has been made of the preliminary report of the Board of Officers constituted by Special Orders No. 122, current series, Adjutant-General's Office. See inclosure B².

The accompanying map of Sandy Hook, inclosure B², shows the situation and extent of the Government reservation, and the location of the buildings, etc. It is distant about 20 miles from New York City over a course navigable for the largest vessels and lying entirely within the line of outer defenses for New York harbor. The present dock facilities at the Government landing are inadequate for the proper and secure handling of the heavier guns which, in the near future, will probably be comprised in our sea-coast armament. The dock is, however, easily repairable, and at an expense of from $10,000 to $15,000 it could be made secure and accessible for discharging or loading vessels capable of transporting all the material required for sea-coast armament to any part of the coasts of the United States. Deep and still water providing safe anchorage for vessels is found close at hand.

The railroad connections to this point are by means of the Southern Railroad of New Jersey from Long Branch, terminating at the company's wharf on Sandy Hook. From Long Branch easy connections can be made by means of the Reading and Pennsylvania systems to any point in the United States. For instance, the route from Watervliet Arsenal to this point would be via Delaware and Hudson Canal Company's Railroad and the West Shore Railroad to the vicinity of Jersey City, thence by either of the systems mentioned to Long Branch and Sandy Hook, the total distance being about 184 miles. It is considered by the Board that the utilization of these railroad facilities is absolutely necessary to the full development of the advantages of Sandy Hook as a proving ground. This could be easily effected by building on the reservation a branch connecting the road leading from Long Branch and the firing point. This branch would be about 1½ miles in length and could be constructed at an estimated cost of $10,000 per mile. This branch constructed and the wharf repaired as stated above, together with some dredging to cost about $300, the transportation facilities to Sandy Hook would be ample, and superior to those at any point visited by the Board.

inherent in a water range over navigable waters, and can be overcome. In calm weather, it is believed, the range firing to sea can be done with sufficient accuracy, and advantage can be taken of such weather to make these firings.

The absence of any water range at Richland is a serious disadvantage, primarily, because there could be no tests of shell bursting in water and no tests of high explosive shell or aërial dynamite torpedoes upon objects on water; and it is believed that this very important and recent branch of defensive appliances can not be properly developed except over a water range.

Sandy Hook possesses a marked advantage over Richland in the complete facilities which can be afforded for transportation both by rail and water. Its location for a proving ground, as a convenient center for receipt of guns, etc., from points of supply and their distribution to points of final destination can not probably be excelled. It is, moreover, at present the only military reservation in the vicinity of New York Harbor which can be used for extensive firing tests, and, considering the relative magnitude of the defenses required for New York Harbor and vicinity, it will be most convenient to retain the proving ground at Sandy Hook for the conduct of experiments required in connection with the erection of forts and batteries in close proximity to the ground where they are most needed.

Sandy Hook possesses the capacity for the conduct of experiments and tests considered by the Board absolutely necessary to the full development of the resources of a perfect proving ground, and from which the Department would be excluded were it confined to an exclusively land range; moreover, there is nothing which could be done on such a range which could not for practical purposes, although under certain disadvantages, be accomplished at Sandy Hook. Assuming, therefore, that the suggested improvements have been made, the Board has to report that none of the sites visited by it is preferable to the proving ground now in possession of the Government at Sandy Hook.

JOHN E. GREER,
Captain, Ordnance Department, U. S. Army.
FRANK HEATH,
Captain, Ordnance Department, U. S. Army.
R. BIRNIE, Jr.,
Captain, Ordnance Department, U. S. Army.

for the gun procured in this country, was due to the early delivery demanded by the Department, to insure the early completion of the type gun of this caliber. The increased cost over present prices of finishing and assembling this gun was due to the very limited facilities existing in the old gun shop for guns of this caliber, as well as to the inexperience in making guns of this size.

12-inch B. L. mortar, steel, type—	
Cost of forgings	$11,408.43
Finishing and assembling	6,379.38
Cost of completed mortar	17,787.81

The average cost of the 3.2-inch B. L. rifle, steel, was—

Cost of forgings	$455.00
Finishing and assembling	520.11
Cost of gun complete	975.11

Very respectfully,

D. W. FLAGLER,
Brig. Gen., Chief of Ordnance.

The SECRETARY OF WAR.

O

PROCEEDINGS OF THE BOARD.

Proceedings of a board of officers convened at San Diego, Cal., pursuant to the following order, viz:

SPECIAL ORDERS, No. 53.

HEADQUARTERS OF THE ARMY,
ADJUTANT-GENERAL'S OFFICE,
Washington, March 9, 1891.

[Extract.]

* * * * * * *

3. By direction of the Secretary of War a board of officers to consist of—
Brig. Gen. Alexander McD. McCook;
Col. George H. Mendell, Corps of Engineers;
Maj. Amos S. Kimball, quartermaster;
is constituted to meet at San Diego, Cal., at the call of the President thereof, for the purpose of making an examination for a suitable site for a military post and harbor defenses at or near the city of San Diego, etc., and obtaining information relative thereto, as required by an act of Congress approved February 24, 1891, as follows:

AN ACT to provide for the selection of a site for a military post at San Diego, Cal., and for other purposes.

*

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and is hereby, authorized and directed to cause an examination to be made for a suitable site for a military post and harbor defenses at or near the city of San Diego, in the State of California, and to report to Congress a particular description of the land required for such purposes and the amount of money for which the owners of such land will convey the same to the United States for the purposes aforesaid. He shall further report what in his opinion is the value of such land, and if the price asked for the same is reasonable.

The report of the board will be transmitted to the Secretary of War. Upon the final adjournment of the board the members thereof will rejoin their proper stations. The travel enjoined is necessary for the public service.

* * * * * * *

By command of Maj. Gen. Schofield.

J. C. KELTON,
Adjutant-General.

SAN DIEGO, CAL., *April 3, 1891.*

The board met informally pursuant to the foregoing order. Present: All the members.

After visiting North Island and Point Loma the board concluded to advertise for proposals, as follows:

PROPOSALS FOR A SITE FOR A MILITARY POST AT SAN DIEGO.

HEADQUARTERS DEPARTMENT OF ARIZONA,
Los Angeles, Cal., April 8, 1891.

Brig. Gen. Alexander McD. McCook, U. S. Army, Col. George H. Mendell, Corps of Engineers, U. S. Army, and Maj. Amos S. Kimball, quartermaster U. S. Army, having been constituted a board of officers for the purpose of making an examination for a suitable site for a military post and harbor defenses at or near the city of San Diego and obtaining information relative thereto, in pursuance of "An act to provide for the selection of a site for a military post at San Diego, Cal., and for other purposes:

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That the Secretary of War be, and he is hereby, authorized and directed to cause an examination to be made for a suitable site for a military post and harbor defenses at or near the city of San Diego, in the State of California, and to report to Congress a particular description of the land required for such pur-

The Board also descended the eastern face of Point Loma and examined Ballast Point and the uncompleted batteries now there, and the land in the immediate vicinity. They find that sufficient fortifications can be placed either upon the eastern extremity of the point or upon the site of the uncompleted water batteries.

The Board returned to San Diego by way of La Playa, a piece of comparatively smooth land suitable for a garrison of two companies, which could be supplied with water by connection with the water mains of the city of San Diego. The Board finds that La Playa is well adapted for the construction of docks, deep water coming close to its shore, where vessels of any size could lie and receive and discharge their cargoes.

The Board then adjourned until 7 o'clock a. m., May 15, 1891.

A. S. KIMBALL,
Major and Quartermaster, U. S. Army, Recorder.

SAN DIEGO, CAL., *May 15, 1891* (7 o'clock a. m.).

The Board met pursuant to adjournment.

Present, all the members.

The Board then thoroughly examined the land offered by the Pacific Beach Company, lying on the shore of the Pacific Ocean, about 7 miles northwest of the city of San Diego.

The Board then proceeded to the land mentioned in the proposition of James Gillmore and George W. Hardacre, and carefully examined the same.

The Board next visited Ocean Beach, situated immediately south of the entrance to False Bay, and inspected the land offered by the Los Angeles, San Diego and Yuma Railroad Company, which consists of a tract of about 5 acres carrying a right to certain well waters.

The Board also examined the land tendered by the Point Loma Land and Town Company, which lies on the Pacific Ocean, about 1 mile north of the boundary of the Point Loma Reservation.

The Board then adjourned until 9:30 o'clock a. m., May 16, 1891.

A. S. KIMBALL,
Major and Quartermaster, U. S. Army, Recorder.

SAN DIEGO, CAL., *May 16, 1891* (8.30 o'clock a. m.).

The Board met pursuant to adjournment.

Present, all the members.

The Board then thoroughly inspected the land tendered by the San Diego Land and Town Company, situated within the National Rancho, including a portion of the Chula Vista Tract, and lying in the neighborhood of 4 miles from the National City.

The Board also proceeded to the land in the Otay Ranch, 14½ miles from the city of San Diego, offered by the same company, and carefully examined the same.

The Board then adjourned until 9 o'clock a. m., May 18, 1891.

A. S. KIMBALL,
Mjaor and Quartermaster, U. S. Army, Recorder.

The Board then proceeded to reëxamine the site tendered by . Gillmore and George W. Hardacre.

The Board then adjourned to meet at the call of its president.

A. S. KIMBALL,
Major and Quartermaster, U. S. Army, Recor

LOS ANGELES, CAL., *July 29, 1*

The Board met informally May 22 and 23, 1891, and discusse relative advantages of the several sites examined. It was found sary to obtain further information regarding some of the tracts o which was afterwards received and considered separately by eac vidual member of the Board, and is now filed with and forms p the several bids herewith, numbered from 1 to 11, inclusive, on t closed abstract.

By reason of the delay necessary to obtain the additional inform it was found impracticable to make a report then, and it was arr that each member of the Board, after returning to his station, s prepare and submit a memorandum setting forth his views, for con ation in the preparation of this report, which was done, and th clusions reached herein are the individual opinions of each mem the Board, arrived at after personal inspection of all available sit careful consideration of all obtainable facts relating to them.

The following requirements are deemed essential by the Board f proper

DEFENSE OF SAN DIEGO HARBOR, CALIFORNIA.

In order to prevent occupation of San Diego harbor by a hostile it will be necessary to place batteries on each side of the ent namely on Ballast Point and on the west end of North Island, so c

The entrance is 400 yards in width. The depths both inside an side are favorable for stationary torpedoes. The shores are low.

It is also advisable to occupy Point Loma with a mortar batter a few guns, which, while aiding the defense of the entrance, se cover, in part, the ocean bight which lies in front of the city an bor, from which if not deterred by fire from Point Loma vessels bombard the city and harbor at easy range.

If from Point Loma as a center we describe an arc of 5 miles r to represent the limit of effectual fire from Point Loma batteries, by the chart that an enemy may lie without the arc secure from t tation and yet be within 5 miles of the city and harbor. It th comes necessary for full protection of the city and harbor to o with batteries still another point to the southeast of the Cor Hotel. The point best suited for this purpose is locally known a Brick Yard, and is about 7 miles southeast of Point Loma. Tak gether with Point Loma these batteries will cover all the spac which the city and harbor can be bombarded.

The Brick Yard tract ought to be occupied by two or three guns mortar battery.

It will be understood that at or in the vicinity of these batteri rangements for defense by rapid-firing guns of adjacent shore beaches accessible to landing parties will be necessary. Mere al to this point is here made, it being considered not to be necessa the purposes of this report to more fully describe the arrangement may be possible or expedient.

There are certain sites that either from remoteness, want of commu cation, topography, or other considerations are conspicuously unsu able for military purposes, and which therefore do not seem to requi extended notice. These are the brickyard property, No. 8 on abstra offered by the Coronado Beach Company, which is too small and t low; the Otai property, 1,000 acres (No. 1 on abstract) and the Paci Beach site, 600 acres (No. 10 on abstract) which are too remote; t Point Loma Land and Town Company, 720 acres (No. 5) the topograp of which is unfavorable; the Los Angeles, San Diego and Yuma Ra way Company, one block, about 5 acres; the Klauber tract, 1,455 acr (No. 3) and the several tracts offered by David Gamman and Thomas Sedgwick, agents (No. 4) situated about 6 miles inland from San Dieg which latter are inconveniently situated, with unfavorable topograph

Of the sites offered the Hardacre tract, No. 11 on abstract; the Chu Vista tract near National City, No. 2; the North Island, No. 9; Cor nado Heights, No. 6, alone require close discrimination.

The Chula Vista tract lies near the railroad at National City, is favo able in topography, affords good sites for quarters, gardens, ranges, a maneuvers, and is watered with mains already laid through the groun or in close proximity. The neighborhood is in part under a high degr of cultivation, which is being constantly extended. If the defenses the harbor were not an important element of the problem, these adva tages might, in the opinion of the Board, warrant favorable consider tion. But this site is about 15 miles distant from each of the importa batteries and 4 or 5 miles distant from the brickyard battery. Th disadvantage is, in the opinion of the Board, fatal.

The same objection applies to the site at Coronado Heights.

An important fact affecting the North Island site is that it is not the mainland, and that it can not be reached by land, unless by a ci cuitous route heading the bay. The direct route must be by ferry. T city of San Diego and the principal batteries are all on the other si of the harbor. The supplies of the post must be delivered by ferr Any sudden requirement for a detachment of troops at another poi would need to be by ferry. The ground lies nearly level, the highe point being about 30 feet above high-tide sea level. Drainage to b or ocean is favorable. A wharf site and right of way are included the harbor. While adjacent to the North Island battery, it is 7 or miles from the brickyard, and is separated from the principal batteri on the reservation by the width of the harbor.

The Hardacre tract, No. 11 on abstract, is the site of all offered nea est to the reservation, from which it is distant about 2 miles. It h the advantages of proximity to the principal batteries situated on t reservation, it is near the railroad and within convenient distance San Diego, and it is on the mainland. The topography of the tract varied and lends itself well to the different requirements of a large po It affords ground suitable for gardens and opportunity for targ ranges. A sufficient area of gently undulating plain affords favorab ground for maneuvers, and higher rolling ground offers advantageo positions for quarters. The facility for drainage is good. Connecti can be conveniently made with the city water supply. At La Play on the reservation, 2 miles distant, there is frontage on the bay, wi deep water close at hand to float any vessels that can enter the harb

The buildings of the post may be placed so as to be screened fro observation of an enemy by intervening high ground.

The tract, containing 810 acres, is owned by many individuals, w have agreed to sell to the United States their several holdings

Abstract of bids for a site for a military post at San Diego, Cal., in response to the attached advertisement dated Los Angeles, Cal., April 8, 1891, and opened May 12, 1891, by the Board of Officers constituted to make examination for said site.

Present: Brig. Gen. A. McD. McCook, and Maj. A. S. Kimball quartermaster, U. S. Army.

No.	Names of bidders.	Post-office address.	Area offered.	Price per acre.	Total amount.	Description of property.
			Acres.			
1	San Diego Land and Town Co., Wm. G. Dickinson, manager.	National City, Cal	1,000	$150.00	$150,000.00	West end of Otay Ranch, to be taken in such shape as may be selected. Situated about 14 miles southeasterly from business center of San Diego, and 6 miles from ocean.
2	.....do	.....do	757	300.00	227,100.00	Part of National Ranch and part of Chula Vista Tract, situated about 8½ miles south from business center of San Diego, the western boundary of the tract within about half a mile of San Diego Bay, as follows: ¼ Sec. 141, 160 acres; ¼ Sec. 142, 160 acres; fraction ¼ Sec. 143, 37 acres; fraction ¼ Sec. 144, 120 acres; fraction ¼ Sec. 145, 160 acres; E. ½ of ¼ Sec. 166, 80 acres; and E. ½ of ¼ Sec. 167, 40 acres.
3	A. Klauber.....	San Diego, Cal.....	1,455	75 00	109,125.00	Being part of lot 13 of the partition of Rancho Mission of San Diego, made under decree of Superior Court January 7, 1885.
4	Joseph A. Allison, trustee; David Gammon and Thomas S. Sedgwick, agents.	.....do	1,070 1,265 1,355 1,655 1,995	41.30 46.90 47.75 46.34 45.26	44,200.00 59,325.00 64,700.00 76,700.00 90,300.00	Lands situate 6 miles east of San Diego, in ranges 1 and 2 west, townships 15 and 16, south, San Bernardino base and meridian. United States public survey. Comprising portions of sections 1, 6, 25, 30, 31, and 36, as shown by map.
5	Point Loma Land Loan and Town Co., F. S. Jennings, president.	.....do	320 400	150.00 100.00	48,000.00 40,000.00	Pueblos 196 and 201..... } About 1 mile north of the United States reservation on Point Loma. Pueblos 193, 192 and 145. }
6	Coronado Beach Co.....	Coronado, Cal	600	100.00	60,000.00	Coronado Heights, within about 2 miles of the boundary line between the United States and Mexico. The Coronado Beach Co. donates its interest in this tract, and guarantees that if the lands are condemned, the total cost to the United States to secure complete title to those portions held by private owners shall not exceed the sum named, viz. $60,000.
7	Los Angeles, San Diego and Yuma Railway, W. G. Carlson, president.	San Diego, Cal.....	(*)	Donation.....		Block 77 of the suburb of Ocean Beach, city of San Diego, Cal. Provided the United States will make use of Point Loma reservation as its principal military post.
8	Coronado Beach Co.....	Coronado, Cal	330 80	....do ....do		Brick Yard Tract. Provided Brick Yard Tract is accepted for post. Opposite Ballast Point, at the month of the harbor at Coronado Heights, or between Coronado Heights and Hotel, including whatever land may be required for batteries.
9	.....do	.....do	640	(†)		North Island Coronado Beach, including, free of charge, land needed for batteries, or any portion of its property lying to the southward of Hotel Coronado.
10	Pacific Beach Co., Geo. B. Hensley, secretary.	San Diego, Cal.....	600	125.00	75,000.00	At Pacific Beach.

NATIONAL CITY, CAL., *April 27, 1891.*

DEAR SIR: The San Diego Land and Town Company offer the Government of the United States, as per advertisement attached, for a site for a military post, 1,000 acres (more or less) of the west end of Otay ranch, to be taken in such shape as may be selected, at $150 per acre.

This land is of the celebrated red mesa soil, free from frost, and will raise successfully all kinds of semitropical fruits.

The Otay River runs through the tract, and from the bed of said stream wells may be constructed and water pumped to supply all needs of the post for domestic, stock, and irrigation use.

Three miles below, from the same stream, the celebrated Coronado mineral water is obtained, and doubtless the same quality of water could be found on the Otay ranch.

The land is situated about 14 miles southeasterly from the business center of San Diego, about 4½ miles east of San Diego Bay, and 6 miles from the ocean.

The National City and Otay Railway (standard gauge) runs from San Diego to within about 3 miles of the tract offered, and should the land be accepted this company will undertake to construct the road through the land so taken, on a line which shall be most convenient for the use of the post.

A small map is attached which will give you an intelligent idea of the location of the lands and surroundings.

The climate is perfect, free from strong wind, extreme heat or cold, and as a hospital resort can not be better.

All of which is respectfully submitted.

Yours, truly,

WM. G. DICKINSON,
General Manager.

A. S. KIMBALL,
Quartermaster, U. S. Army, Los Angeles, Cal.

NATIONAL CITY, CAL., *April 27, 1891.*

DEAR SIR: The San Diego Land and Town Company offer the Government of the United States for a military post, as per advertisement attached, that part of National ranch described below, and a part of Chula Vista tract, viz:

	Acres.
¼ sec. 141	160
¼ sec. 142	160
Frac. ¼ sec. 143	37
Frac. ¼ sec. 144	120
¼ sec. 145	160
E. ½ ¼ sec. 166	80
E. ½ ¼ sec. 167	40
Total	757

More or less, for $300 per acre, reserving the right of way of National City and Otay Railway, 40 feet in width, as said road is not constructed; also reserving a right to enter upon said land for repairs of the water mains of this company as now laid on National avenue, First, Second, and Third avenues.

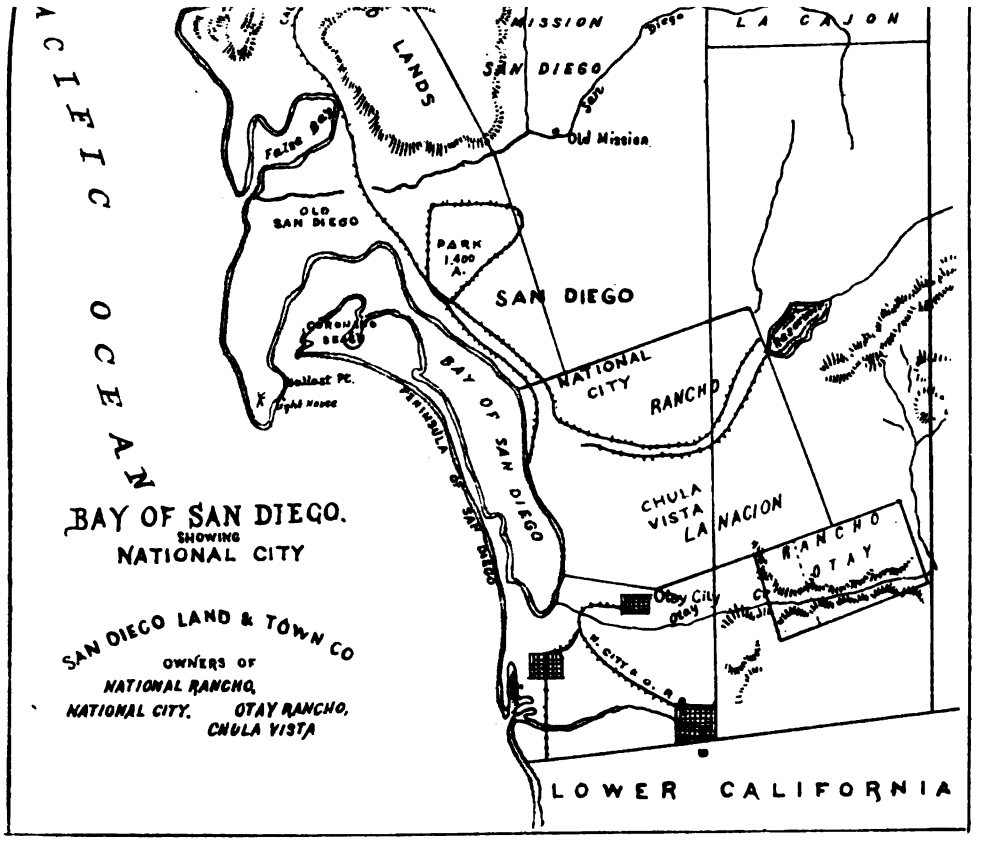
A map of the lands is attached, the lands colored in red. The map also shows the location of said National City and Otay Railway running directly through the lands; also the location of Coronado Railroad, just west of the tract offered; also pipe lines on avenues named.

The western boundary of the tract offered is within about half a mile of San Diego Bay, which bay may be reached by the continuation of Fifth street, west from National avenue, which street will be opened 80 feet wide if this offer is accepted.

The land is of the celebrated red mesa, with clay subsoil, and produces all semitropical fruits to perfection. It slopes gradually from the bay towards the foothills, and commands a fine view of San Diego Bay, Coronado Beach, ocean, Point Loma, the entrance to the harbor, and the full length of the channel in San Diego Bay, the cities of National City and San Diego, the Coronado Islands, and Mexican boundary line.

The soil is of such a character as that drives and walks can be made and maintained easily and inexpensively, and the grounds ornamented with a tropical growth, which it is believed would make it the most beautiful military post in the United States.

The climate has an equability not equaled by any of which there is any record, making it desirable for hospital patients.


PACIFIC OCEAN
LANDS
MISSION
SAN DIEGO
LA CAJON
Old Mission
OLD SAN DIEGO
PARK 1,400 A.
SAN DIEGO
NATIONAL CITY
RANCHO
BAY OF SAN DIEGO
PENINSULA OF SAN DIEGO
CHULA VISTA
LA NACION
RANCHO OTAY
LOWER CALIFORNIA
BAY OF SAN DIEGO.
SHOWING
NATIONAL CITY
SAN DIEGO LAND & TOWN CO
OWNERS OF
NATIONAL RANCHO,
NATIONAL CITY.
OTAY RANCHO,
CHULA VISTA

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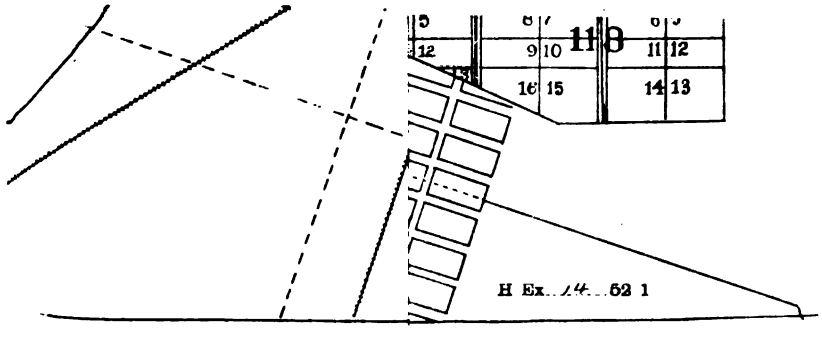
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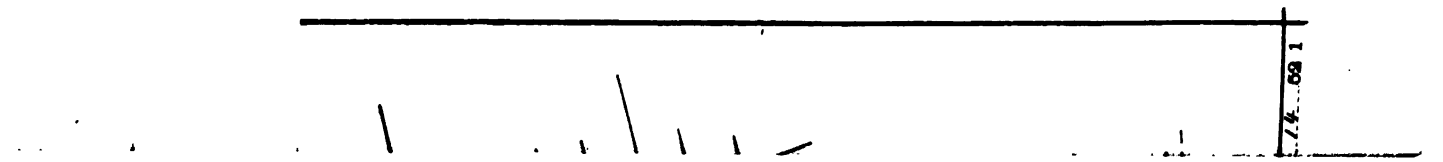


Proposal No. 2.

We propose to sell the following tracts:

That portion of section 36 west of the railroad; the rectangular portion in northwestern part of section 31; the portion in the southern part of section 25, and the portion off the west side of section 30, as shown by dotted lines, as follows:

Of section 36, 615 acres, at $50 per acre	$30,750
Of section 31, 215 acres, at $75 per acre	16,125
Of section 25, 375 acres, at $30 per acre	11,250
Of section 30, 60 acres, at $20 per acre	1,200
Making 1,265 acres, at $46.90 per acre	59,325

DAVID GAMMAN,
THOMAS S. SEDGWICK,
Agents.
JOSEPH A. ALLISON,
Trustee.

Proposal No. 3.

We propose to sell the following tracts:

All of section 36; all of the tract in section 31; parts of section 1 and 6, south to dotted line; the portion in southern part of section 25; and a portion off the west side of section 30, as shown by dotted lines, as follows:

All of section 36, 640 acres, at $50 per acre	$32,000
Of section 31, 250 acres, at $75 per acre	18,750
Of sections 1 and 6, 30 acres, at $50 per acre	1,500
Of section 25, 375 acres, at $30 per acre	11,250
Of section 30, 60 acres, at $20 per acre	1,200
Making 1,355 acres at $47.75 per acre	64,700
From this may be deducted the items of sections 25 and 40, 435 acres, amounting to	12,450
Leaving 920 acres, at $56.80 an acre	52,250

DAVID GAMMAN,
THOMAS S. SEDGWICK,
Agents.
JOSEPH A. ALLISON,
Trustee.

Proposal No. 4.

We propose to sell the following tracts:

All of section 36, all of the tract in section 31, parts of sections 1 and 6, south to dotted line; the portion in the south part of section 25; and the portion off the west side of section 30; and so much of section 1 as lies to the west of the railroad, as follows:

Of section 36, 640 acres, at $50 an acre	$32,000
Of section 31, 250 acres, at $75 an acre	18,750
Of sections 1 and 6, 30 acres, at $50 an acre	1,500
Of section 25, 375 acres, at $30 an acre	11,250
Of section 30, 60 acres, at $20 an acre	1,200
Of section 1, 300 acres, at $40 an acre	12,000
Making, 1,655 acres, at $46.34 an acre	76,700
From this may be deducted the items in sections 25 and 30, 435 acres, amounting to	12,450
Leaving 1,220 acres, at $52.66 an acre	64,250

DAVID GAMMAN,
THOMAS S. SEDGWICK,
Agents.
JOSEPH A. ALLISON,
Trustee.

wish to have propositions including other parts of this tract, for say a part of se tion 12, we hold ourselves ready to make any modifications that may be desirable.

DAVID GAMMAN,
THOMAS S. SEDGWICK,
Agents.
JOSEPH A. ALLISON,
Trustee.

SAN DIEGO, CAL., *May 6, 1891.*

GENTLEMEN: The Point Loma Land, Loan, and Town Company desires to offer the prices below the following described lands for a site for a military post and harbor defenses at San Diego, viz: Pueblos 196, 201, 193, 192, and 145, or so much there as your honorables may think necessary in case you should decide it a suitable loc tion. Pueblos 196 and 201 contain each 160 acres; 193, 192, and 145 contain, collec ively, about 400 acres, making about 700 acres in all. This land is situated about mile north of the United States reservation on Point Loma, occupying 1 mile of t summit from which the entire harbor is visible, sloping toward the bay and ocea extending to and embracing 1¼ miles of ocean front. Pueblos 196 and 201, 320 acre $150 per acre; the other pueblos at $100 per acre.

Not knowing what amount of land would be required nor the character necessa we can only make our proposition general. This land is the least broken by ravin or otherwise of anything on Point Loma, and while there is no large body of pra tically level land, yet there is a very large portion of it but very slightly rolling.

We would be glad to furnish further particulars or to have the board personal inspect the land.

Very respectfully,

POINT LOMA LAND, LOAN, AND TOWN COMPANY,
By F. S. JENNINGS, *President.*

The Board of Officers to select a site for a military post and harbor defenses, at S Diego, Cal.

CORONADO, CAL., *July 14, 1891.*

DEAR SIR: In accordance with the advertisement published in the San Die Union asking for proposals for a site for a military post and harbor defenses at S Diego, Cal., this company submits the following proposition:

The Coronado Beach Company hereby guarantees to deliver to the Government the United States a full and complete title to that tract of land known as "Cor nado Heights," including in said delivery each and all of the now existing indivi ual titles to land located within the limits of said tract, for the sum of $50,000, pr vided the said Government will locate on said tract the permanent military post be established in the vicinity of San Diego Bay.

Respectfully,

E. S. BABCOCK,
President Coronado Beach Company.

Maj. A. S. KIMBALL,
Quartermaster U. S. Army, Los Angeles, Cal.

CORONADO, CAL., *May 6, 1891.*

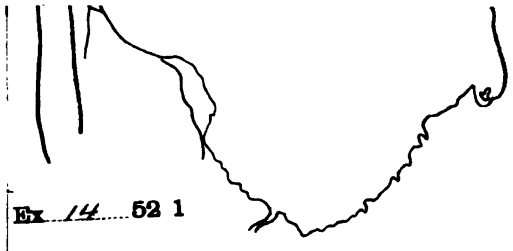
DEAR SIR: In accordance with the advertisement published in the San Diego Unio asking for proposals for a site for a military post at San Diego, Cal., this compan submits the following proposition:

The Coronado Beach Company will deed to the Government, free of charge, its en tire interest in that tract of land known as "Coronado Heights," containing abou 600 acres.

There are private interests in town lots situated in this tract which can be pur chased, probably, for a sum not exceeding $30,000. If the Government should exer its right of eminent domain and condemn the private interests in this tract th Coronado Beach Company will undertake to guarantee that the expense shall no exceed $60,000.

There is now passing through the said "Coronado Heights" tract a 12-inch cast iron main, conveying the celebrated Coronado water, which water will be furnishe the Government at the rate of 15 cents per 1,000 gallons.

The Coronado Railroad, connecting Coronado with San Diego, also passes throug the entire length of the said "Coronado Heights" tract, giving communication wit the city of San Diego, via either National City or Coronado, in a half-hour's time.



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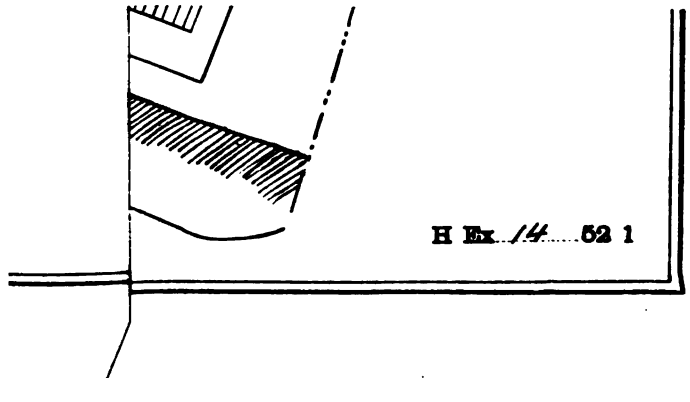

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Upon a careful inspection of the ground it will be seen that military great strategic value are numerous on said Point Loma and can be equaled around San Diego.

Respectfully submitted,

LOS ANGELOS, SAN DIEGO AND YUMA RAILWAY CO
By WM. H. CARLSON, *Pre*
H. G. MERRILL, *Secre*

CORONADO, CAL., *June 9*

DEAR SIR: In accordance with the advertisement published in the Sa Union asking for proposals for a site for a military post and harbor defense Diego, Cal., this company submits the following proposition:

The Coronado Beach Company will deed to the Government, for the consid of $200 per acre, a tract of land described as follows:

Situated on the peninsula or island of San Diego (and Coronado), embraci feet to the south of and commencing at or near the Old Reservoir, at "Brick and extending from high-water mark, ocean, to high-water mark, bay, and c ing 60 acres, more or less; subject, however, to Coronado Railroad Compa county boulevard rights of way.

Yours truly,

CORONADO BEACH COMP
By CHAS. T. HINDE,
Acting President.

Maj. A. S. KIMBALL,
Quartermaster, U. S. Army, Los Angeles, Cal.

CORONADO, CAL., *May 6, 18*

DEAR SIR: In accordance with the advertisement published in the San Union asking for proposals for a site for a military post at San Diego, Cal., Coronado Beach Company submits the following proposition:

The Coronado Beach Company will deed to the Government, free of expe what is known as the "Brick Yard" tract, containing about 330 acres.

The Coronado Railroad, connecting Coronado with San Diego, passes through entire length of the said "Brick Yard" tract, giving communication with the of San Diego, via either National City or Coronado, in a half hour's time.

This tract of land is equally accessible by means of steam water navigation as railroad.

There are located on the "Brick Yard" tract, 4,000,000 new brick, which will sold to the Government at $6 per thousand.

The main pipe conveying the noted "Coronado" water is laid through the sa "Brick Yard" tract. This water will be delivered to the Government, on sa tract, at the rate of 15 cents per 1,000 gallons.

There is also a wharf extending into the Bay of San Diego from said "Bric Yard" tract, which would also be included in the deed.

In consideration of the acceptance by the Government of the above proposition the Coronado Beach Company will deed, free of expense to the Government, 80 acres embraced in the point of land located immediately opposite what is known as "Ballast Point," at the mouth of the harbor, said 80 acres to be used for military defenses.

The Coronado Beach Company will also transfer without charge, in the event of the acceptance of the above offer, whatever land the Government may deem necessary for the establishment of batteries at "Coronado Heights" or at any point on the neck of land between "Coronado Heights" and the "Hotel del Coronado."

Yours truly,

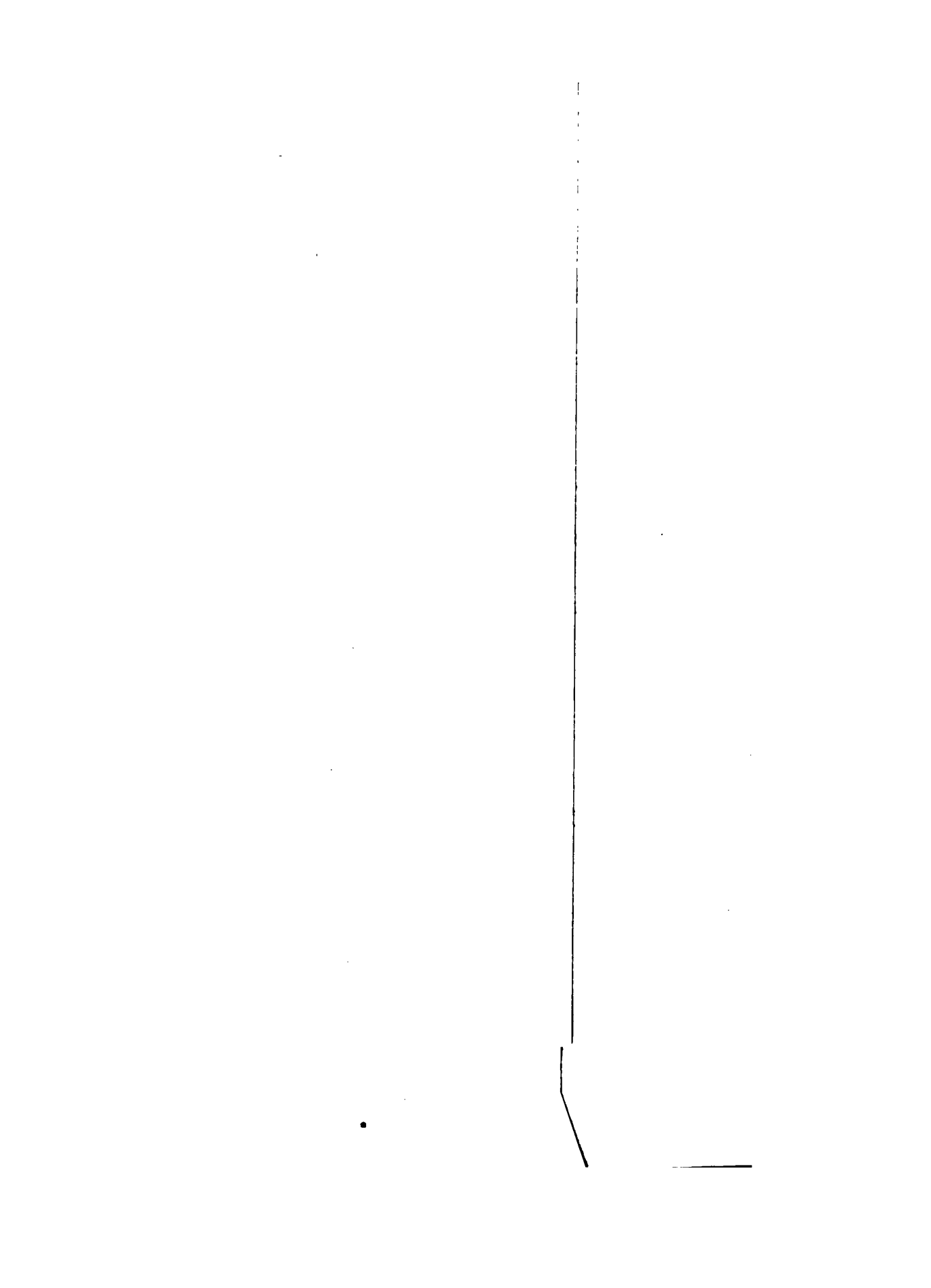
By CORONADO BEACH COMPANY,
E. S. BABCOCK, *President.*

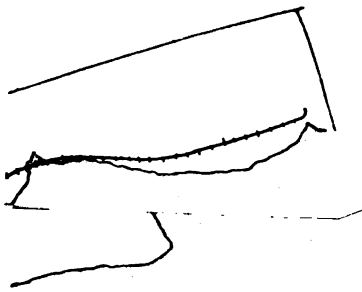
Maj. A. S. KIMBALL,
Quartermaster, U. S. Army, Los Angeles, Cal.

CORONADO, CAL., *June 9, 1891.*

DEAR SIR: In accordance with the advertisement published in the San Diego Union, asking for proposals for a site for a military post at San Diego, Cal., this company submits the following proposition:

The Coronado Beach Company will deed to the Government a tract of land of an size ranging from 640 to 800 acres, said tract to embrace that portion of what





wn as "North Island," Coronado Beach, California, lying nearest the mouth of harbor of San Diego, at the following prices:

.) For all land of said tract, subject to occasional submergence by tide water,) per acre.

!) For all land of said tract not subject to submergence by tide water, $300 per e.

ı the event that the above proposition is accepted by the Government, the Coro- lo Beach Company will, at its own expense, connect the tract of land purchased the Government with its present system of water pipes, and furnish the famous onado water to the Government at 15 cents per 1,000 gallons.

he Coronado Beach Company will also connect said tract of land with its steam tor line to the ferry, now being used to connect Coronado with San Diego, free of ense to the Government.

he Coronado Beach Company will also grant the right of way, and ferry and arf privileges, in connection with said tract of land, to or through any other por- ı of said North Island, so that, should it be desired, the Government could e communication with the mainland through any portion of said North Island, operate its own ferry.

he Coronado Beach Company will also deed to the Government, free of charge, ıtever land the latter may need for the establishment of batteries located to the hward of the Hotel del Coronado.

Yours, truly,

CORONADO BEACH COMPANY,
By CHAS. T. HINDE, *Acting President.*

aj. A. S. KIMBALL,
Quartermaster, U. S. Army, Los Angeles, Cal.

CORONADO, CAL., *May 6, 1891.*

EAR SIR: In accordance with the advertisement published in the San Diego ion, asking for proposals for a site for a military post at San Diego, Cal., this ıpany submits the following proposition:

he Coronado Beach Company offers to the Government, at a price to be fixed by missioners to be appointed by the President of the United States, 640 acres of at is known as "North Island," Coronado Beach, which lies nearest the mouth of harbor.

n the event that the above-mentioned tract is taken the Coronado Beach Company l deed to the Government, free of charge, whatever land the Government may d for the establishment of batteries on any portion of its property lying to the thward of the Hotel del Coronado.

he Coronado Beach Company will also, at its own expense, connect the said tract 640 acres with its present system of water pipes, and furnish the famous Coro- do water to the Government at 15 cents per 1,000 gallons.

he Coronado Beach Company will also connect said tract of 640 acres with its am motor line to the ferry, now being used to connect Coronado with San Diego, e of expense to the Government.

he Coronado Beach Company will also grant the right of way, and ferry and arf privileges, in connection with the said 640-acre tract, to or through any other rtion of said North Island, so that should it be desired the Government could have mmunication with the mainland through any portion of said North Island, and n its own ferry.

Yours, truly,

CORONADO BEACH COMPANY,
By E. S. BABCOCK, *President.*

laj. A. S. KIMBALL,
Quartermaster, U. S. Army, Los Angeles, Cal.

SAN DIEGO, *May 5, 1891.*

IR: In response to your advertisement for proposals for site for military post and bor defenses at San Diego, I am instructed by the board of directors of the ific Beach Company to submit to your honorable board the following proposi- n:

he Pacific Beach Company will convey for the above purpose by a good title 600 es of land at Pacific Beach (or less) for the sum of $125 per acre, and said Pacific ch Company also agree to lay a water main, 6 inches in diameter, to the line of the

land hereby offered, said pipe to be connected with the present system of Diego Water Company, which system is now supplied by the flume with pur tain water.

GEO. B. HENSLE
Secretary Pacific Beach Con

A. S. KIMBALL, ESQ.,
Quartermaster, U. S. Army, Los Angeles, Cal.

NOTE.—The above tract represents about 40 acres hill land and balanc level, slope to south over 1 mile of ocean front, close to motor line. I shou said lay water main through the tract instead of to the line, which w abundant pressure for all purposes. Should you need more than 600 acres furnish it adjoining.

SAN DIEGO, CAL., *May 7,*

DEAR SIR: We offer to the United States for a military post and harbor d the following lands, situated in the city of San Diego, county of San Die State of California, adjacent to the bay of San Diego, in accordance with t posals for bids to be opened May 12, 1891, to wit:

Pueblo lots 209, 210, 220, 221, 222, 223, 238, 239, 240, 241, 242, SE. 1-2 207, NW. 206, and portions 224, 225, and 227 of the pueblo lands of San Diego, more parti shown by map attached hereto, containing 810 acres, more or less, at a gross $230,000.

Respectfully submitted.

JAMES GILLMOR
GEO. W. HARD.

A. S. KIMBALL,
Quartermaster, U. S. Army, Los Angeles, Cal.

SAN DIEGO, CAL., *May 7,*

DEAR SIR: If more land than is contained in the offer herewith subm desired, we can secure, in addition to the lands mentioned in said bid, pu 200, containing 160 acres, at $48,000, and pueblo lots 311, 312, 313, 314, 315, containing 60 acres, at $18,000.

These lands are also indicated upon the map attached to said bid.

Respectfully submitted.

JAMES GILLMO
GEO. W. HARI

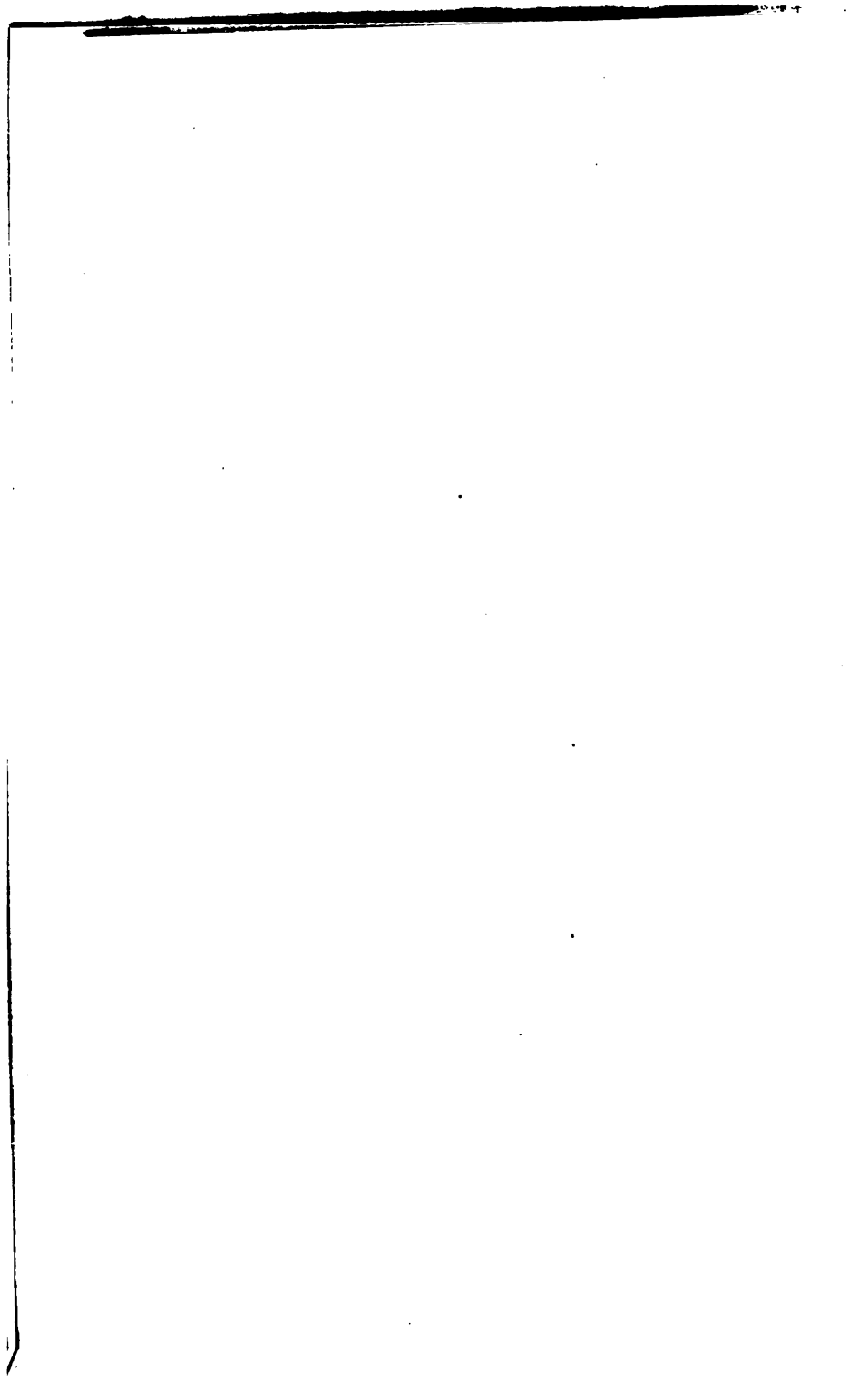
A. S. KIMBALL,
Quartermaster, U. S. Army, Los Angeles, Cal.

SAN DIEGO, CAL., *May 30*

MY DEAR SIR: We herewith inclose, pursuant to your inquiry of May tracing in duplicate of that portion of San Diego embraced in Point Loma, the location of the lands offered by us and the portions of said lands belo each individual owner as far as practicable, together with a statement in di showing names and addresses of each of the owners, and the number of a price per acre asked for the holdings of each, and also two copies of contra the terms of which we offered the said lands to the United States.

We endeavor to comply with the request of your letter so far as we c without an actual accurate survey and platting of the lands. We hold tracts signed by all the owners except a few small holders. We have an of the Sisters of Charity at Los Angeles of their 5 acres in pueblo lot 222, at price than the amount indicated in the statement, but we are satisfied we ca the land for the sum named. If not, of course we will secure the land wit creasing the amount of our bid to the Government. The same remark wi to the owner of 2 acres in the same pueblo lot, G. B. McConnelly. He has here who offers the land at the price named in the statement, but we hope it for a little less. Mr. McConnelly lives in Vermillion, Ohio, and we have communication with him up to this time.

We have a contract from A. R. Higgins for pueblo lot 238. A part of this sold by him, but he assures us he can secure a conveyance to the Governm all the owners. They are all small holders.



Pueblo lot 240, 20 acres, at $300	$6,000
Name of owner: T. Wrampleмeir, Berkeley, Cal.	
Pueblo lot 220, 40 acres, at $150	6,000
Name of owners: Crippen & Jennings, San Diego, Cal.	
Pueblo lot 241, 20 acres, at $175	3,500
Name of owner: J. A. Allison, San Diego, Cal.	
Pueblo lot 242, 20 acres, at $175	3,500
Name of owner: J. A. Allison, San Diego, Cal.	
Pueblo lot 238, 20 acres, at $250	5,000
Name of owner: A. E. Higgens, San Diego, Cal.	
Pueblo lot 239, 20 acres, at $200	4,000
Name of owners: G. W. Hardacre and heirs J. W. Robinson, Mrs. A. High, and G. A. Stevens, San Diego, Cal.	
Total	228,565
Surplus for contingent expenses to perfect sales	1,435
Grand total as per bid	230,000

JAMES GILLMORE,
GEORGE W. HARDACRE.

SAN DIEGO, *April 27, 1891.*

I hereby agree to sell to the United States of America, for a military post and harbor defenses, the following-described tract and parcel of land situated in the city of San Diego, county of San Diego, State of California, for the sum of $——, and hereby constitute and appoint James Gillmore and Geo. W. Hardacre my sole agents to offer said lands to the United States for said purpose, in conformity with sealed proposals for bids made by A. S. Kimball, quartermaster, U. S. Army, said bids to be opened May 12, 1891, and agree to pay said Gillmore and Hardacre —— per cent commission on purchase price as such agents when said land is accepted and paid for by the United States.

BRIEF WITH ACCOMPANYING SKETCH.

PROPOSED MILITARY POST AND HARBOR DEFENSES AT SAN DIEGO, CAL.

By an act of Congress approved February 24, 1891, it was provided, viz:

That the Secretary of War be, and he is hereby, authorized and directed to cause an examination to be made for a suitable site for a military post and harbor defenses at or near the city of San Diego, in the State of California, and to report to Congress particular description of the land required for such purposes and the amount of money for which the owners of such land will convey the same to the United States for the purposes aforesaid. He shall further report what in his opinion is the value of such land, and if the price asked for the same is reasonable.

To carry out this act a board of officers consisting of Brig.-Gen. McCook, Col. Mendell, engineers, and Maj. Kimball, quartermaster (S. O. 53, Par. 3, H. Q. A., A. G. O., March 9, 1891), convened at San Diego April 31, 1891, and proceeded to make the necessary examination. Proposals having been invited from land-owners in the vicinity for such lands as might be suitable for the purposes indicated, eleven bids were received, and the same were opened May 12, 1891, in the presence of the bidders, and later all the sites offered were visited and personally inspected by the board. The following in brief are their report, conclusions, and recommendations:

HARBOR DEFENSES.

The board first inspected the Government land in San Diego Harbor at Point Loma and La Playa, where the board could find no suitable location for a garrison of the size contemplated, but are of opinion that

uitable available ground for the construction of batteries which
part of the harbor defenses at Point Loma and Ballast Point,
Government land and on the west side of the entrance to San
arbor, and separated by about 1 mile. They deem it further
le to occupy with batteries two points on the eastern side of the
rance, one on the west end of North Island and the other on
nsula separating the harbor from the ocean, at a point 7 miles
st of Point Loma in a straight line, and 3 miles by way of the
om the proposed site of the battery on North Island. The area
required for the North Island battery is 38.56 acres, which the
ecommend be acquired by condemnation proceedings, inasmuch
ngineer's Department, which requires the balance of the point
ion (18.85 acres) for purposes of harbor improvement, is about
re it by the same process. The land in question is shown on
mpanying plat in yellow.

and required at the second point on the east side is about 60
hich is offered for $200 per acre and is shown on plat No. 8 of
s marked in red.

THE MILITARY POST.

ites offered for a military post and the opinions of the Board
are as follows, their location being shown on the plat by black
on red ground:

By the San Diego Land and Town Company, 1,000 acres, more
of the west of Otay Ranch, 14 miles southeast of San Diego,
east of San Diego Bay and 6 from the ocean, at $150 per acre.
rd find this site conspicuously unsuitable on account of the re-
s from the points of defense.

By the San Diego Land and Town Company, 757 acres, more
of the Chula Vista tract of National Ranch, 8½ miles from the
section of San Diego and one-half mile from the bay, at $300
e. The Board find this tract favorable in topography, well
, on line of communication, and surrounded by a cultivated
rhood, and if the defenses of the harbor were not an important
these advantages might warrant favorable consideration. But
ite is about 15 miles from each of the important batteries and 4
a the nearest, this disadvantage is, in its opinion, fatal.

By A. Klauber, 1,455 acres, more or less, or as much thereof
be desired, being part of lot 13 of the partition of the Rancho
, 5 miles east of San Diego, at $75 per acre. The Board find
t inconvenieptly situated, with unfavorable topography.

By Joseph A. Allison, trustee, 7,340 acres, in five separate
r so much thereof as may be desired, of the estate of Robert
situated 6 miles east of San Diego, in ranges 1 and 2 west,
ps 15 and 16 south, at an average of about $46 per acre. These
rd reject for the same reasons as No. 3.

. By the Point Loma Land, Loan, and Town Company, 320
$150, and 400 acres at $100, of Pueblo lands 145, 192, 193, 196,
, situated about 1 mile north of the Point Loma Reservation.
rd find this land unsuitable, for the same reasons as Nos. 3 and 4.

By the Coronado Beach Company, 600 acres of the tract known
nado Heights, located on a long strip of the peninsula, at its
or upper end, 2½ miles from the Mexican boundary line. To
the Board find the same objections as to the Chula Vista tract,

By the Los Angeles, San Diego and Yuma Railway Company,

block 77 of the tract known as Ocean Beach, area not stated, bu
mated at about 5 acres, as a donation, provided the United State
establish a post on its reservation of Point Loma. This the Boa
jects as inconveniently situated, with unfavorable topography.

No. 8. By the Coronado Beach Company, 60 acres, more or less,
point on the peninsula known as the Brickyard, about 7 miles e
Point Loma, at $200 per acre. The Board finds this site suited f
location of a battery, as above mentioned, but too small and too l
a military post.

No. 9. By the Coronado Beach Company, 640 acres, more or le
a price to be fixed by a commission appointed by the President o
United States, situated on North Island. The objection to this
in the opinion of the Board, is that it is not on the mainland and
be reached directly only by ferry; a serious objection in the event
sudden requirement for the troops. Further, while adjacent to th
posed North Island battery, it is 7 or 8 miles from the proposed b
at the Brickyard (No. 6), and is separated from the principal pro
batteries on the reservation by the width of the harbor.

No. 10. By the Pacific Beach Company, 600 acres at a point k
as Pacific Beach, lying on the shore of the Pacific Ocean, about 9
northwest of San Diego, at $125 per acre. Found unsuitable b
Board on account of its remoteness.

No. 11. By James Gilmore and George W. Hardacre, 1,030 acr
tracts of 810, 160, and 60, the same being Pueblo lots of the city o
Diego, situated at the north end of the bay of San Diego, with
miles of the business center of the city and 2 miles from the reserv
at various prices, the first tract, of 810 acres, aggregating $2
The Board find that this tract has the advantages of proximity t
principal batteries on the reservation, is near the railroad, within
venient distance of San Diego, and is on the mainland. The top
phy is varied and lends itself to the different requirements of a
post, with ground suitable for gardens, for maneuvers, target r
and advantageous position for quarters. The facility for drain
good, and connection can be conveniently made with the city
supply. The tract is owned by many individuals, all of whom
agreed to sell their several holdings to the United States.

The price of the land, in the opinion of the Board, is reasonabl
it has been examined by the Major-General Commanding the A
who has expressed a most favorable opinion of the land, its situ
and adaptability for military purposes. The Board therefore r
mends the purchase of this land for the purpose of locating there
military post.

In submitting the proceedings of the Board, the Major-General
manding the Army remarks:

> I concur fully in the opinion of the Board in the within report in respect
> necessities of the defense of San Diego Harbor, namely, that a battery sh
> located on Ballast Point, one on the west end of North Island, one on Point
> and one at what is known as the Brickyard, about 7 miles south of Point
> There should also be provided, in my judgment, at or very near each one o
> points, suitable ground for a small post to be occupied by the artillery garr
> those batteries. No one point can be regarded as a suitable location for a
> garrisons.
>
> As a site for a large post to be garrisoned by troops of all arms, the most de
> in the vicinity of San Diego is, in my judgment, that selected by the Board ca
> Hardacre Tract. But, as before remarked, that site would not be a conveni
> tion for the artillery troops required to man the several batteries above men
> It would, on the contrary, be an excellent location for the nucleus of an
> infantry, cavalry, and field artillery.

O

REPORT

OF THE

ECTRICAL COMMISSION

APPOINTED

CONSIDER THE LOCATION, ARRANGEMENT, AND OPERATION OF ELECTRIC WIRES IN THE DISTRICT OF COLUMBIA.

MESSAGE

FROM THE

RESIDENT OF THE UNITED STATES,

TRANSMITTING

A report of the Electrical Commission of the District of Columbia.

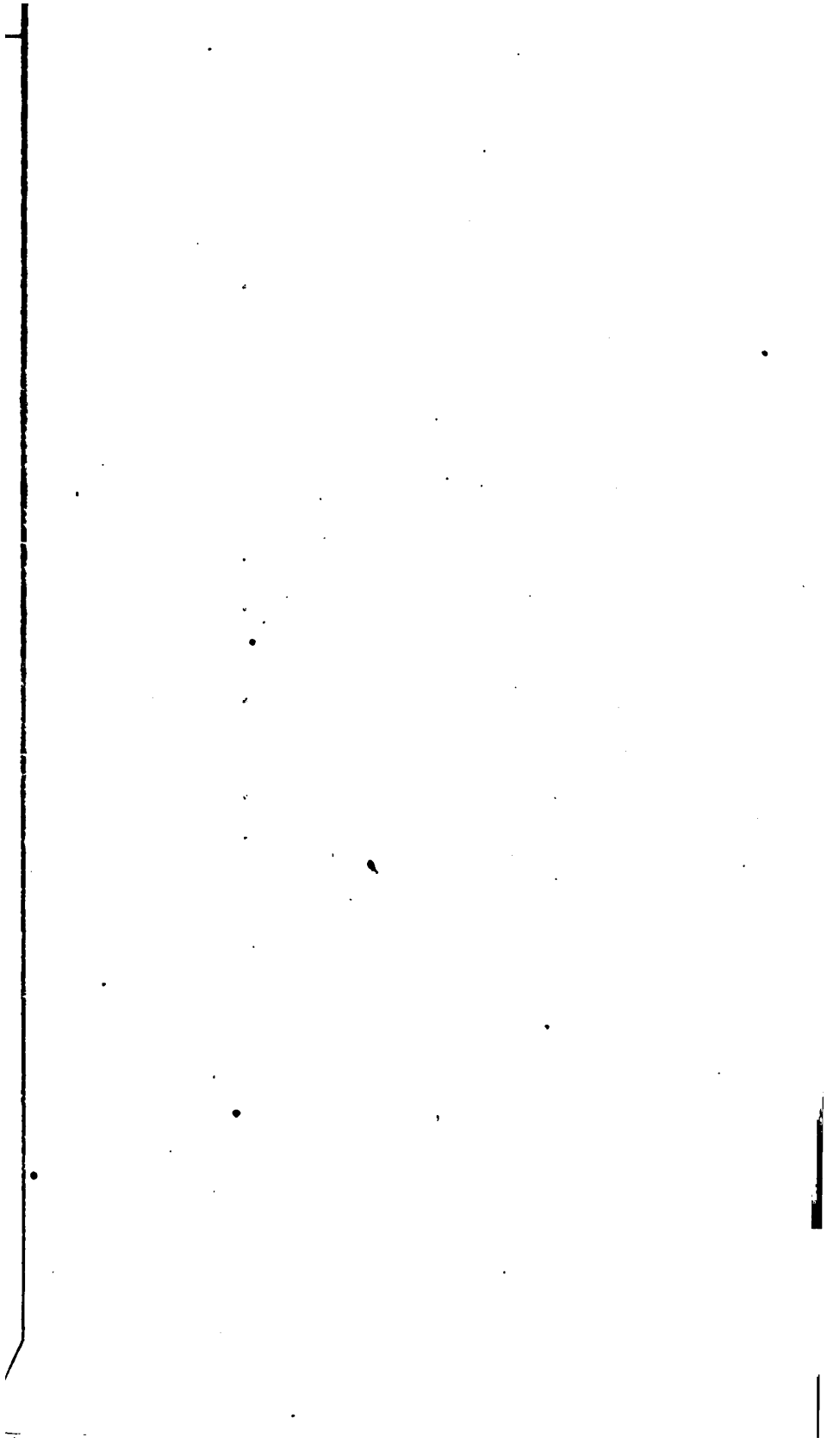
UARY 5, 1892.—Referred to the Committee on the District of Columbia and ordered to be printed.

The Senate and House of Representatives:

transmit herewith the report of the board appointed by me under ause in the District of Columbia appropriation act approved August 890, "to consider the location, arrangement, and operation of tric wires in the District of Columbia," etc., to which the attention ongress is respectfully invited.

BENJ. HARRISON.

XECUTIVE MANSION,
December 23, 1891.



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REPORT OF THE ELECTRICAL COMMISSION TO THE PRESIDENT OF THE UNITED STATES.

OCTOBER 26, 1891.

The PRESIDENT:

Acting upon your instructions under provisions of the District appropriation act approved August 6, 1890 (U. S. Stat. at L., vol. 26, p. 304, par. 3), which authorizes the President of the United States to appoint a board consisting of three persons to consider the location, arrangement, and operation of electric wires in the District of Columbia, and to report to the President not later than December 1, 1891, the members of the Board met in the city of Washington and duly organized on January 5, 1891. Our conclusions, together with a general plan, estimates of cost, rules, and regulations, with other data bearing upon the questions involved, are herewith respectfully submitted.

That the conclusions arrived at may be fully comprehended, it is proper to briefly outline our investigations and the characteristic features of conduits and approved electrical appliances so far as they relate to public service. In these investigations we were materially aided by the District Commissioners, the engineering department of the District, and the District electrician, all of whom were unsparing in their efforts to furnish us with local data bearing upon the subjects of our investigations. We also availed ourselves of the very valuable information contained in the published report of 1889 by Maj. Charles W. Raymond, Engineer Commissioner of the District of Columbia, together with other data kindly placed at our disposal by Maj. Raymond, which he had collected since the publication of his report. In view of the strong protests made in 1889 by the Western Union Telegraph Company and the United States Electric Lighting companies against the enforcement of underground wiring and the developments in electrical science since that period, the Board addressed letters to the managers of these corporations for information as to the status of their electrical plant in the District, and their present views as to the feasibility of underground wiring. This correspondence is appended to our report. Its perusal will be found of interest. The United States Electric Lighting Company, from being a strenuous opponent, has become a strong advocate of underground wiring. The Postal Telegraph Company, whilst evidently disliking to incur the expenditure, confesses, through its managers, that the service is as good and the interruptions in consequence of storms and other accidents are decidedly less than overhead. This company, it will be observed, upon perusal of the testimony of its manager, Mr. W. H. Allen, has had 1⅛ miles of its main circuit underground in Washington for over six years and, therefore, speaks from actual experience. The Western Union Company stands alone in its persistent opposition to underground wires in the District. Its managers still use the old arguments that electric induction, consequent upon underground work, will tend to materially decrease the speed of transmission where the multiplex system of telegraphy is used, as is the case with them, and

thus either increase the tariff on messages or force them to discontinue many of their branch offices in Washington and possibly establish their main lines and offices just outside the city. In other words, the telegraph company may run its main lines around the cities. The management further argues that if overhead wires are a nuisance in Washington, why not in Alexandria and every other small town, thus leading to the inference that underground service must either be general or not at all.

Wishing to consider all the conditions relating to subway service with fairness, the Board proceeded at once to make investigations into all the features of public electrical service, both at home and abroad and, with this in view, made personal investigations in leading cities of the country, where extensive experiments had been tried and tested for a sufficient number of years to justify reasonable conclusions. We find as will be seen by appended correspondence with the authorities of New York, Chicago, Brooklyn, Philadelphia, and London, that telegraph wires operating duplex, quadruplex, and other devices of signaling are, and have been for many years, operated successfully with wires of the main circuits in their passage through cities laid underground.

The letter of Mr. W. H. Preece, the electrician of the postal department of Great Britain, who has often been quoted from his general reference to induction retardation as an authority by the telegraph companies, clearly refutes all the Western Union Telegraph Company's objections from an electrical standpoint. Mr. Preece says: "One to miles of main circuit placed underground in entering or passing through a city would have *no practical effect whatever* in operating a single or quadruplex circuit; nearly all our circuits entering London have from *5 to 10 miles* underground."

The importance of acquiring a safer and more permanent system than that secured by overhead wiring in cities becomes evident when we refer to the havoc of recent storms, especially that of last spring when we are informed nearly every line of poles and a large portion of the wires in the District were broken and literally shattered to pieces cutting off nearly all telegraphic and telephonic communication within and without. In addition to this, nearly if not every wire of the fire alarm and police-signal system was broken and the electric lights of the city were cut out. Aside from the general commercial loss and inconvenience, a large amout of indirect damage was occasioned by the broken poles and falling wires. This was not simply confined to the District of Columbia, but extended to other cities all along the coast notably New York. Had the wires been underground no such havoc could have been created.

Leaving out of question all the other wires, it seems as if the telegraph lines, which are national carriers of messages, should be made as reliable in their service as the railways are in theirs, and in view of the public franchise which they enjoy the service of these companies should be made as good as reasonable requirements can make them.

To satisfy ourselves that the requirement of placing their wires underground in the District will not add to what might seem an unfair increase of burden upon the telegraph and other electrical companies, we have taken occasion to ascertain what these various corporations contribute toward the maintenance of the public thoroughfares and other improvements of the District which they use in common with other taxpayers. We, therefore, applied to the District assessor, Mr. Trimble, for information upon the subject. His statement, which embraces all the corporations using the public streets under various franchises, we

be found in the Appendix. It will be noticed that the aggregate annual tax of the Western Union Company upon its business and property for 1890 is $352. The Postal Telegraph Company (doubtless through mistake) does not appear on the tax books at all, whilst the United States Electric Lighting Company pays $225 in all, or a trifle over the receipts upon one and one-half arc light. The aggregate annual tax for 1890 of all the telegraph, electric-lighting, and telephone companies of the District is $1,057.50.

These facts need no comment. The maintenance of overhead wires in defiance of public requirements under such circumstances places the responsibility of failure upon the Government. Whilst the suggestion of Maj. Raymond to impose a high tax upon each pole maintained, if carried out might have a tendency to induce compliance, it would at the same time be a humiliating confession that the Western Union Company, though deriving its power from, is more potent than the United States Government. These methods of conciliatory coaxing have proved vain in New York, Chicago, and Brooklyn, and only the summary exercise of power by actual removal with the ax has succeeded.

The Board having, after due investigation, concluded that underground wiring in the city is practicable from a mechanical and electrical standpoint, proceeded to ascertain the nature of the obstacles encountered, how to overcome them, and to determine which of the varied systems of construction already tried are best suited to the wants of the District of Columbia, and whether public interests will best be served under private or public ownership. To determine the best system and method of construction it is first necessary to compare the relative surface and underground condition of the thoroughfares of Washington and other cities. Cities like New York and Chicago, which are literally filled with unsystematic masses of every conceivable kind of pipes and mechanism for gas, water, steam heat, power distribution, and where gas pipes, either through poor construction originally or bad connections and disturbances from innumerable sources, are full of leaks, require far different treatment from such a city as this which has been under systematic control during the greater part of the time since its conception.

The majority of the conduits for wires in New York have, of necessity, been wrought-iron pipes, iron cement-lined pipes, or cast-iron ducts. The extent, difficulties, and nature of these varied systems are lucidly outlined by Mr. Maver, the subway company's electrician, in his article recently read before the American Institute of Electrical Engineers, reproduced in this report.

One of the main difficulties encountered is that of the entrance of gas into the conduits, its collection at the manholes, and explosion, when mixed with air, by the accidental sparking of wires caused by broken circuits or leakage, or contact with flame from matches or lighted cigars by negligent employés. These explosions have frequently resulted in loss of life, besides damaging the conduit. There are several methods of prevention suggested and practiced. In New York air is forced into the conduits under pressure, thus excluding the gas from entry. In other cities, notably Philadelphia, manholes are ventilated by connecting them with the hollow posts of electric arc lamps and perforating the upper ends. The suction of gas by pumping from the conduits is another method strongly advocated. In opposition to this is the very reasonable theory that such suction will only increase the rate of inflow. In Washington, unlike New York, and other cities, there

is very little gas leakage, owing, doubtless, to better control of such work by the administration. Too much care can not be taken, not only in the proper laying of the gas mains, but also of the house connections, which, in view of the utter lack of system in such work in New York City, and the interference and displacement of pipes by the numerous parties who operate under the streets independently of one another, doubtless cause much of the leakage encountered there. In all these cases there is strong ground for belief in our minds that where gas is encountered to any extent the ultimate remedy will have to be applied at the gas trench rather than the conduit.

THE ELECTRICAL PROBLEMS.

Electrically speaking, it has been demonstrated that electric-light wires can be laid side by side with telephone or telegraph wires, each being insulated, without materially interfering with the practical operation of either of the latter, the only requisite in each case being that the insulation be properly protected and that in the case of the telephone wire the latter shall be in metallic circuit to overcome the effects of current induction. The reports of David R. Walker, chief of the electrical bureau of Philadelphia, clearly show that with proper care close proximity of telephone and telegraph wires with electric-light wires of high potential will not impair the operation of either; and as an instance we cite a lead-incased telephone wire in metallic circuit for a distance of 3 miles in the same duct and directly adjoining a lead-incased electric-light wire having a voltage of 3,000 volts which has been in successful operation upon Broad street, Philadelphia, ever since 1886, and is still in use and in good condition. In this same duct, within a creosoted conduit, four other wires are being used for telegraphic purposes. In the city conduit system of Philadelphia we are assured by Mr. Sager, manager of the electric department, that the electric-light and telegraph wires are usually laid in adjoining ducts, the cables being but 3½ inches apart. Such is also the case in Chicago, as reported by the city electrician, Mr. J. P. Barrett, of that city. The only precaution that seems to be requisite in placing high and low potential cables near each other is that the outer casing of the cables should be grounded at every manhole to prevent accident.

If, as has been shown, a telephone and electric-light wire having a high potential current can be safely laid side by side in the same duct, it is evident that, with reasonable care by the use of separate or double-chambered manholes for distribution, a system of conduits with separate distinct ducts for different potential cables can be regarded as practicable.

METHODS OF UNDERGROUND WIRING.

The most important problem to be solved from the standard of municipal economy is embodied in the question, Shall the underground wiring be effected through open subways, solid insulated conductors, or a system of closely insulated or mechanically protected ducts? The popular notion, and unquestionably the ideal method, would be through an open subway, so constructed as to admit ready access to the wires or cables at all points and obviate the necessity of subsequent cutting open of streets. Open subways, to meet these requirements, should obviously be made large enough to contain the water, gas, and sewer pipes for public and private service of the city. Even then, unless con-

ructed upon each side of the street under the sidewalks or parking eas, the streets would still require to be cut open for the purposes of ouse connections. This, therefore, necessitates either separate subays on each side of the street inside of the curb lines, or a central ubway sufficiently deep for sewer service combined with a conduit sysm of connections to the buildings on each side of the streets through hich water, gas, and electric service pipes and wires can be extended. In either of these methods, in order to make wires accessible for eady repairs or connections, it would be necessary to provide sufficient oom on each side of the vertical row of cables to admit of passage beween them. The impracticability of massing cables within conduits n the popular supposed idea, can readily be noted by a glance at the lan of the proposed subway for the city of Toronto. We refer to this pecial plan because it illustrates the too common error that a subway, ecause large enough to walk through, will furnish ready access to verything within it. By observing this plan it will be noted that hile the few exterior cables nearest the inner space could be reached n an emergency, all the rest would be inaccessible, and could not be eached either for connections or repairs without removal. The diffiulty of removal of any number of cables can only be appreciated when t is considered that, first, they would each have to be disconnected at he manholes; second, in view of the fact that each cable, even with a listance of only 300 feet between manholes, would weigh one-half ton r more, their removal would involve tedious labor, and their close proximity to one another would likely materially damage them from requent rough handling and frictional contact; third, if all bunched together, high and low potential wires indiscriminately, the possible destruction at any time of all cables by short circuiting with a single one, in consequence of a break or leak, would be too great to warrant such risk. The pipe connections for water, gas, and other purposes from the mains to each side of the street would still further complicate the construction with a network of pipe lines across the line of the conduit. Aside from these reasons the purpose of a subway in the case of Toronto, as of other cities in which similar plans have been proposed, would not be effected, as the sewer, gas, and water connections from the central subway to the buildings on each side would still have to be provided for, and, unless constructed upon each side of the street under sidewalks, or connected every 25 feet or thereabouts for house connection with conduits specially arranged for the admission or removal of wires and pipes, the streets would still be subject to the periodical operations of the trench-digger.

A subway system in the center of the streets to obviate the necessity of opening them for water, gas, sewer, and other connections must necessarily be deep enough for sewer service, and have ample capacity for all water, gas, and other pipe mains for public and private service; it must provide ample room for placing within it all kinds of electric wires and cables substantially in a manner to be both safe and always accessible for connection, repair, or removal. Finally, it must have a system of cross conduits for house service through which pipes and wires can be securely laid from the mains within the subway to the buildings on each side of the street; such cross or connecting conduits must be sufficiently large to admit of separate entrance for repairs or renewal. A subway of this kind with its tributary conduits would not only be extremely expensive of itself, ranging in cost from $175,000 to $250,000 per mile according to width of street and other local conditions, but its construction would, in addition, involve not only the taking up and dis-

when once laid, need little or no attention in the future. The Edison incandescent system, as developed in the United States, is constructed upon this basis.

The Ferranti and Brooks systems are also typical of this nature of construction. They are specially applicable to the economical transmission of electric currents of high potentials for light or power from distant sources, and where cheap, abundant water power is available, or where, in view of excessive cost, grounds for power plant can be acquired sufficiently cheaper on the outskirts than within the central part of a city, as is the case in London. These systems may, therefore, ultimately prove of vast advantage to this District in the future should the power of the upper Potomac Falls be utilized. As they involve a separate, distinctive construction, they are inapplicable to the general underground wiring for telephone, telegraph, and other service.

We are, therefore, brought to a consideration of the conduit duct system which admits of drawing in and taking out wires and cables as circumstances require. This is unquestionably the cheapest and most practicable system thus far developed, all things considered, for general municipal wiring purposes. In view of this fact it has been developed in every conceivable form to meet the varied conditions of service and limitations of outlay. Thus, in New York City, owing to exposure, to rough handling, and the interminable number and kind of materials found underground, scarcely any kind of conduit short of iron could be used. The same, to a limited extent, is the case in a part of Chicago. In Brooklyn and Philadelphia creosoted wooden ducts are extensively used with a high degree of success. Experiments in Baltimore and Washington have developed a practical conduit system in the shape of rectangular sections of glazed vitrified clay, partitioned off into separate distinct chambers. It is under what is known as the Lynch and Lake patents, illustrations of which accompany this report. Both the telephone and electric light companies use it in their construction to the exclusion of all other kinds. The reasons for its adoption by the electric-light company are given in Mr. Renshaw's communications relating to the United States Electric Light Company's system. There are numerous other systems possessing merit, some of which are fully illustrated and referred to elsewhere in this report. The simplicity of the clay conduit, the durability of its material, and special applicability to the service in Washington, in view of the few impediments, taken in connection with its comparative cheapness and capacity, lead us to the conclusion that of those conduits having had a reasonably successful test of several years it best meets the requirements of a system specially suitable to the District of Columbia.

Having determined upon the most suitable system of underground wiring in the District, we come to the following question: What shall be provided for in a conduit system for District wiring? The answer to this depends upon the following conditions: (*a*) Shall the several franchised companies now operating wires be allowed or required to extend them in their own separate conduits? (*b*) If the companies extend their conduits, shall the telegraph companies doing business in Washington be required to build conduits for all their wires? (*c*) Shall each of these corporations in the conduits already constructed, and in all future conduits, as provided, be required, as is the case of Philadelphia and in many large cities of Europe (see forms of London and Paris franchises in appendix), to provide not less than one duct on each line of a conduit for the free and exclusive use of the public, in addition to such other obligations as may be deemed proper?

If these questions are answered in the affirmative, then the requirements of the District for conduits would be limited to the fire-alarm and police-signal service. These District overhead wires could, therefore, now be placed underground in the territory covered by the telephone and electric lighting companies and into the telegraph company conduits as soon as the requirements would be enforced as to the telegraph companies. This would make the removal of overhead wires for District purposes in the central section of the city comparatively inexpensive, and its future extension underground cotemporary with that of all other electrical service.

The requirement on the part of corporations using the public thoroughfares to provide at least one duct on each line of conduit free of cost, and for the exclusive public service, is not a new proposition nor an unreasonable one, when it is considered that these streets are paved, drained, cleaned, and maintained at the public expense, and that, while all other classes of business are conducted upon grounds for which a rental is paid, these corporations are practically using the public domain without expense.

Whilst we urge these requirements upon the basis of an affirmative answer to the questions enumerated, we believe public interests will be best subserved upon a negative basis. In other words, we would recommend that all future conduits shall be built, owned, and controlled by the District, believing in the broad theory that the public thoroughfares and grounds are and should be the exclusive public property, and that the business necessarily conducted for public purposes upon these thoroughfares should be owned and controlled by the public.

This is not an untried theory. Years of actual trial has demonstrated the practicability of a public water-supply system under municipal ownership. In the United States, 43 per cent of the waterworks and fully 75 per cent of the investment in waterworks plant are owned and controlled by municipal corporations. Without exception, municipal ownership in these cases has brought about a material improvement in the water supply and a reduction in the water rates. Already over seventy cities in the United States own their own electric-light works. There are a few gasworks yet owned by municipalities; among such owners is the city of Philadelphia. These, according to Mayor Fitler's annual report for the year 1890, are among the most valuable paying investments of the city, having netted over $5,400,000 in three years. Municipal ownership of electric-light plant, though comparatively a new feature in municipal service, proves, as will be seen by the appended tabular exhibit of the prevalent prices in eighteen of these cities, after making all reasonable allowances for maintenance, interest, repairs, etc., that, under municipal control, though an undeveloped field, the cost of public lighting compares favorably with that under individual ownership.

The tables, as will be seen, contain practically all available data attainable from which results can be reasonably determined. Though the comparative number of lamps and the hours of lighting in these cases are disproportioned to the cost of the plant and though the main factors of the expense are interest, maintenance, and supervision, so that if the lights were increased in number or the hours of daily lighting were augmented the proportionate cost per hour would be less, still, even as they are, the results show an average rate per lamp hour about the same or a trifle less than the average present contract price of an equal number of cities. It must be borne in mind that in the cases cited the cities only light the public streets, whereas if their

s were also utilized for private lighting the expense account for c lights would be materially reduced. It is clear that if, under the unfavorable conditions, municipal lighting can be maintained as p under public as private ownership, the lighting under usual conns can be maintained at decidedly lower figures.

e suggestion is frequently made that, while it might be proper for etter police protection and public convenience to light the public oughfares under municipal management or control, it would be e nature of competition with private enterprises to go further and ly light for individual use. The answer to this is that if the pubperience and public sentiment can justify the supply of water outof hydrant service for personal use, it can for the same reason ly electric currents. In the case of water, the same main can the private as well as the public consumption, and this is the with the electric-light main and the gas main. The mistaken idea such public service interferes with or encroaches upon private s is readily overcome by the evidence that at the very start, to unke such enterprises, in view of encroachment on public rights, possession of a charter is necessary. Why not make bread? ybody needs it, and hence it will be cheaper. This is one of the istical questions put by the opponent of municipal ownership. answer is simple. The baker, like the butcher, the merchant, or manufacturer, does not have to build on the street and use the c thoroughfares for his business. He rents a house or builds one, pays taxes on the ground and buildings. The franchised corporaoccupies the public streets, for which they pay no rental, but from h in the absence of franchise all competitors are excluded. The ness man can not exclude competitors so readily. Independent of reasons, the conservation of public interest in favor of public omy points to the municipal ownership of underground plants upon public domain. A glance at the statistics of electric lighting will one of the main sources of cheaper lighting in towns is the fact they place their electric plants in their pump houses, thus in many s the same buildings, boilers, and engines, and in nearly every case same superintendent can operate both plants. So, too, the same ctors and accountants can look after both. The city electrician his inspectors and line repairers can take care of the wire at the cost, whether that wire supplies current to private and public os or to one alone. The city buys its engines, its dynamos, pays lties on patents, and purchases its coal and other material in the ket, the same as individuals, and hence enters into no competition any private enterprise. These and numerous other reasons point ne expediency of so shaping permits and future franchises that the lic, if not ready now, may at any future period assume control of works.

e have briefly alluded to the subject of municipal control to show while sooner or later the public ownership of electric lighting and r plants is likely to be seriously considered, there can be no quesat this time as to the advisability of the public ownership of the ric conduits. The interviews with the managers of the various rical companies which appear elsewhere in this report show that they are adverse to such ownership by a separate company, and urse it is not at all surprising that they should prefer to own their ducts, or, in other words, to enlarge the scope of their present fran-s. It is sufficiently apparent, without any further illustration, that r public ownership the extent of interference in the tearing up of ts will be reduced to a minimum.

The following, from the mayor's annual report for the city of Philadelphia for 1890, coming from a city which has had five years of practical experience, with a high degree of success, is suggestive on this subject:

This bureau [the electrical bureau of Philadelphia], under the scientific and intelligent management of Chief Walker, has become the Mecca of all the municipal electricians of the United States. Almost every mail brings an inquiry respecting its workings, its cost, and, more especially, its underground wires in actual service and under the control of the bureau. I admit that I had doubts as to the success of underground wires carrying the high tension currents for arc lights, and especially as to the practicability of placing in the same conduits with them the wires to be used for telegraph and telephone service. The success attending the experiments made by this bureau have proven beyond doubt their entire practicability, all this having been accomplished without loss of current from the arc-light wires, either from faulty insulation, decay, or moisture, and without inductive interference from them with those used on telegraph and telephone circuits.

It is my full belief and conviction that with a proper and continuous system of conduits (which the city neither owns nor controls at the present time, and which she should use and possess as early as possible), all the overhead wires in the city, including telegraph, telephone, incandescent, and arc light wires, could be placed underground and be made to work in the most successful and satisfactory manner.

To do this the city should own all the conduits beneath her highways; she should build and perfect them, and then, under judicious regulations, lease the rights and privileges to use them, reserving sufficient space for her own electric lighting and for other municipal purposes.

The city, as soon as she can spare the funds, should establish her own electric-light plant, leaving the private lighting to private companies. If this were done, much annoyance to our citizens and to our departments by the multiplication of poles would be avoided and great relief given by the removal of the forest of poles, of wires, and cables that are now found in the heart of our city.

I suggest that your honorable bodies appoint a committee to examine into the system of underground wires now in use in this bureau, with power to call into consultation the most intelligent and scientific men that can be found. Such an examination will go far to assist in your deliberations, and I feel satisfied will result in the removal of all wires which now encumber our highways and remain as a menace to our firemen particularly and to the people of our city generally.

In the meanwhile, and in order to place the city in a position to obtain her electric lights at the lowest cost, I recommend that the city erect and own all the poles for electric lighting, so that the companies that secure the contracts from year to year can use them, paying such rental as may be fixed. This will at once put an end to the duplication of poles from which the property owners are now suffering.

Believing, as we have endeavored to show, that the interests of the District will be best subserved by public ownership of all future conduits, we have prepared a *general plan* of conduits within the District, anticipating, as we think, the requirements for the future extension of the present service and the undergrounding of all other wires, including those of the telegraph companies and the District police and fire-alarm department.

THE PLANS.

These plans provide conduits with a minimum capacity of four ducts to a maximum of sixteen ducts. For purposes of uniformity and economy we recommend the location of signaling and alarm stations as far as practicable at the southeast corner of the intersections, within reasonable distances apart. These stations can and should be combined with an electric-light pole of approved artistic pattern, so as to economize both space and avoid useless expenditure. The plans and estimates are based upon the rectangular vitrified glazed clay conduit, which has heretofore been referred to and has been found from sufficient trial in the District to meet all the requirements. It is not as cheap as the creosoted conduit systems in use in Philadelphia or Brooklyn, but if incased as provided in concrete, its construction will be of a permanent

character without liability to partial combustion by electric leakage in accidental cases or injury to the cable. On the other hand its cost will be less than iron or other material, and its relative capacity of ducts greater.

The details of construction have been only outlined for general estimates, as they will vary with every block and relative position to the present gas, water, and special electric service pipes and conduits.

The important features in the construction of this system are: First, a permanent and uniform base of concrete (6 inches is a fair thickness); second, the careful laying and alignment of the sections, so as to insure true lines and continuous ducts; third, the proper bedding and encasing of each tier of sections in a uniform layer of small stone or gravel concrete; fourth, the proper construction of the manholes with a good coating of cement mortar or concrete from the base up to the top to render them impermeable both to moisture and gas as far as practicable; fifth, the efficient ventilation of the manholes through lamp connections; sixth, provisions for tight, close-fitting covers and plug or valve sewer connections to manholes in the lower section of the city, liable to overflow or subject to backwater, and ventilated covers with open-trapped sewer connections for manholes in the upper section of the city.

ESTIMATE AND COST.

The following is an appropriate estimate of the length and cost of the conduits and manholes comprising the system:

219,300 linear feet or 41.54 miles	4-duct conduit	$241,230
50,100 linear feet or 9.49 miles	8-duct conduit	105,210
17,600 linear feet or 3.33 miles	12-duct conduit	52,800
11,600 linear feet or 2.20 miles	16-duct conduit	46,400
298,600 linear feet or 56.56 miles		445,640
Allowing 10 per cent for contingencies and supervision		44,564
Total		490,204

Total length of ducts 317.68 miles.
Cost per mile of duct $1,543.

Considering that after construction it will take several years to fill all the ducts, and the cost of maintenance and supervision, we regard that 7 cents per linear foot per year for each duct used is a reasonable rental for the first few years.

The estimates contemplate manholes on an average of 300 feet apart. Local conditions will make this a variable factor. The cost of manholes also varies with the size of conduits, ranging from $40 to $140 each. The figures given will in the aggregate be found sufficiently accurate for purposes of legislative determination.

Accurate and exact details will necessarily have to be prepared under the supervision of the electrical department, after a general plan shall have been determined upon, with special regard to all the governing local conditions of each section of the city. In determining the sizes of the respective lines of conduits we have taken into consideration the service already provided for by the telephone and electric-lighting companies. The 5 miles of conduits laid by each of these companies during the year 1891 have been subject to stipulations in the permits hereto appended. We do not regard it unreasonable to require from each of them the free use of one duct in each line of conduit for the public service.

ELECTRIC STREET RAILWAYS.

Considering that only five years have elapsed since the first electric street railway was laid in the United States, the fact that such tramways are operated in over three hundred cities, with an aggregate of 8,000 miles of such track in operation, leaves no room for doubt as to their future practicability. The question with them, as with the overhead wires for other electrical service, as to adoption to underground wiring, is one largely of cost. In small cities, where the traffic upon streets is light or upon the less populous sections of large cities the objections to poles and overhead wires are largely a matter of sentiment. In the populous sections of large cities the same objections to overhead electric service as apply to telegraph and electric light poles and wires are tenable. There can be no doubt of the practicability of underground wiring in the matter of electrical propulsion, but so long as the street railway companies can obtain the permit they will not find it expedient to add ten thousand or more dollars per mile to their investments. The continuous operation of an electric street railway system on the underground system at Buda-Pesth, Hungary, for the past three years with a very paying traffic is evidence of its practicability. That the system can be materially cheapened there is no room for doubt; and in all probability some of the already numerous inventions in this class of electrical development, if applied in a substantial manner, would prove successful. Experience thus far upon extremely well patronized lines of railway proves that the cable system is even more economical than the overhead electric system. Be that as it may, the value of street railway franchises ought to warrant investments based upon the best modern developments.

With the street railway, as with the water and gas system, if properly designed at the outset, we can conceive a well-adjusted street railway system based exclusively upon municipal ownership and operated for terms of ten years at a time by the highest responsible bidders upon a scale and schedule basis fixed by the city. Aside from the direct operation of street railways by contract on the overhead or underground system, the operation of cars has been effected by what is known as the storage battery, being a system of cells placed in connection with the motor appliance within the cars, and charged with current at the station to an extent to admit of a given length of run. The aggregate number of such cars in America and Europe up to within a year was sixty-five. Their manufacturers from time to time issued glowing accounts of their successful and economical operation. So far, however, a careful investigation does not warrant these claims. The greatest objection to be overcome in the application of the storage battery cars is their extreme weight, that of a car thus equipped being in the neighborhood of from 6 to 7 tons. This limits their usefulness to comparatively level streets, or at most such as have not to exceed a 6 per cent grade of limited length.

Further experiments in this direction may be successful in overcoming some of their present most objectionable features. If they are, the storage battery will, in many respects, possess advantages over any of the present systems, chief among them being that of absolute independence of one car from any of the others. In the one case a derangement in the conductor affects all the cars in the system; in the other, derangements will be confined to the car itself. All that we can suggest upon the subject of electric street railway regulation is that, necessity being the mother of invention, the application of underground and other unob-

jectionable methods in the place of those now applied will not materially progress until the municipalities exact either the underground wire or storage battery propelled systems in the place of the overhead in the central or populous sections, or the cable system.

For lines having small traffic and running into the country from the outskirts of the city, there is no doubt that the electric overhead trolley system is the best and cheapest in every way, and with provisions for undergrounding the wires in the central populous sections of the city and the extension from these points of the overhead trolley system outward, toward the suburbs, the street railways will then meet all the requirements of service in the best attainable manner.

CONCLUSIONS.

(1) In cities overhead wires are objectionable.

(2) Underground wires are practicable for all kinds of electrical service.

(3) Efficient cables for all kinds of electrical service can be manufactured at reasonable cost. Failures of cables heretofore have been due to inferior material, faulty construction, or wrong methods of laying.

(4) Conductors carrying high potential currents may be placed close to telephone or telegraph wires without interfering by induction. To prevent accident, it is well to place the high and low potential conductors in different ducts, and also to use separate manholes or compartments of manholes.

(5) It is not advisable to limit the potential of currents. With proper precautions, currents of the highest potential may safely be used.

(6) Efficient management of electrical matters requires a permanent bureau or department, such as exists in Philadelphia and Chicago.

(7) A single subway in the middle of the street is impracticable:

(*a*) Because of its excessive cost.

(*b*) Because it requires connections under the street to the property lines, and so does not do away with the cutting up and repairing of streets.

Where water, gas, and sewer pipes are yet to be laid, a double subway might be practicable; that is, a tunnel on each side of the street under the sidewalk.

Where electric wires alone are to be accommodated a system of conduit ducts and manholes, on the "drawing-in" plan is preferable.

(8) As regards the ownership of the conduits, we believe that the interests of the city are best subserved by public ownership, and that the method of having them built by a subway company and renting them to the electric companies would result in great trouble and inconvenience to all concerned.

SUMMARY OF RECOMMENDATIONS.

(1) We recommend the creation of a permanent electrical bureau to supervise all electrical work in the District, and to enforce all regulations relating thereto. Its duties should be:

To have charge of the fire-alarm and police-signal service.

To direct and supervise the construction of electrical conduits, the erection of poles, and placing of wires and all other appliances for electrical service by the District government, and to inspect the electrical appliances belonging to private individuals or corporations under permits or franchises.

To make periodical inspections and reports of all electrical appliances in the District.

The bureau should consist of a skilled electrician as chief, with a corps of competent assistants. Sufficient salaries should be paid to secure first-class ability. We would recommend a salary of $4,000 per annum for the chief of the bureau, $2,000 per annum for his principal assistant. Since efficiency will require special local and expert knowledge, both of which increase with length of service, the personnel of the bureau should be as permanent as possible; changes should be made for imperative reasons only.

(2) We recommend that within the limits indicated on the plans submitted all wires should be put underground as soon as possible; and that the District Commissioners be empowered to summarily remove poles and wires maintained overhead after due reasonable notice for their removal has been given.

(3) We recommend the rectangular clay conduit, manufactured under the Lynch-Lake patents, believing that it is best suited to the requirements of the District.

(4) The telephone and electric-light systems being practically underground already, we submit a plan for a conduit system sufficient to accommodate the telegraph, fire-alarm, and police-signal lines of the city, and a reasonable extension of the telephone and electric-light systems. The approximate cost of the system proposed will be $490,000.

(5) We believe that all conduits should be owned by the city, and therefore recommend that hereafter all conduits and subways shall be constructed and maintained by the District government, under the direct supervision of the electrical bureau; and that the District government shall, as soon as practicable, acquire the ownership of those already constructed.

(6) A reasonable rental should be charged for the use of conduits by franchised corporations or individuals. For the conduits above recommended we think that an annual charge of 7 cents per foot per duct would be fair.

(7) Should our recommendation as to the public ownership of conduits not be adopted, and should conduits continue to be constructed by franchised corporations, we would recommend that the franchises of such corporations contain an express provision that one or more ducts on each line be reserved for free public use, in addition to such other compensation as may be thought sufficient for the use of the public ground. We further recommend that this provision be extended to the lines conditionally constructed during the past year, and, if possible, to all existing lines.

(8) In those parts of the District where, for reasons of local expediency, overhead wires may be deemed admissible by the electrical bureau, we recommend that the poles be erected and owned by the District; and that rent, to be determined by the electrical bureau, shall be charged for their use.

Trusting that we have fully answered all the questions submitted to us, and that the plans and other data accompanying our report will as fully meet all the requirements as it is possible under the present conditions,

We are, very respectfully,

ANDREW ROSEWATER.
HENRY A. ROWLAND.
FRANCIS R. SHUNK,
First Lieutenant of Engineers.

Rules and Regulations Governing the Construction and Use of Conduits, Poles, Wires, and all other Appliances for Electrical Service in the District of Columbia.

A.—Definitions.

In the following regulations the definition of the terms used is as follows:

Wires or conductors of the first class are those used for transmitting telographic or telephonic messages or service of like nature.

Wires or conductors of the second class are those used to convey heavy currents, or currents of high potential, or both. Those used for electric lighting or transmission of power belong to this class.

Wires, conductors, or currents are spoken of as being of a certain potential when they are joined to dynamos, batteries, or converters which give them that difference of potential at one point. It is, then, the maximum difference of potential between any two parts of the circuit.

An object is to be considered properly grounded when it is connected with a gas or water pipe or a plate of metal at least 2 feet square sunk in moist ground by a wire or strand of wires having a conducting power equal to one-tenth of a square inch of iron or one-seventieth of a square inch of copper, so that the earth resistance is always less than 10 ohms.

B.—General regulations.

1. *Companies must report yearly.*

Every company, corporation, firm, or individual doing electrical work in the District of Columbia, or owning any wires or cables in the public highways, shall, on or before January 1 in each year, certify under oath to the District electrician the number and location of wires, electrical conductors, conduits, cables, or tubes, and the miles of wire laid under ground or on poles within the District of Columbia. They shall also specify under oath the number and location of the incandescent or arc lamps on their circuits, the number, location, and power of motors they are running by the aid of their circuits and their location, together with the electromotive force and intensity of currents in each locality and through each circuit.

This report must be accompanied by a map of the city of Washington descriptive of the same.

Also the said companies or individuals shall file with the District electrician an annual statement under oath showing in detail the receipts and expenditures of each company incurred in construction, maintenance, and operation of its system.

2. *Companies must report changes.*

All electrical companies doing business in the District of Columbia must file once a week at the office of the District electrician a report on the proper printed blank as to any new constructions, connections, or repairs carried on during the week, and it shall be the duty of the electrician on the receipt of such reports to detail an inspector to report on the same and see that all the regulations are carried out.

3. *Linemen must wear badges.*

All linemen of the different companies, while on duty, must wear a conspicuous numbered badge indicating the name of the company by whom he is employed. To do any work in the putting up or repairing of wires, poles, or other electrical appliances in the public streets, he must have a permit from the District electrician, to be produced at any time when demanded by any member of the police force or other persons designated by the District electrician. If dealing with wires of the second class, he must be furnished with rubber gloves and proper insulated implements, and use the same.

4. *Appliances must be inspected.*

All wires, cables, insulators, switches, lightning arresters, and safety plugs shall only be used or placed in position when accompanied by a permit from the District electrician certifying that they are safe and according to regulation, and every police officer, authorized inspector, or other person authorized by the District electrician may demand the production of the permit from the company owning such devices within twenty-four hours or immediately from the lineman or other workman while he is placing them in position or making any repairs to them.

5. *Circuits are to be branded.*

All cables and wires are to be conspicuously branded by the company owning them at every manhole, as well as at each arc lamp and at each insulator, by a suitable and conspicuous label or brand, easily seen from the street in the case of overhead wires, so that every electrical system can be recognized at once and responsibility for damages or breaking of the law can be quickly fixed.

6. *Dead wires must be removed.*

All wires not in use or that are not to be used within three months are to be removed by the company owning them within ten days after notice from the District electrician.

7 *Right of entrance.*

The District electrician, or inspector authorized by the District electrician, has the right at any time to enter any building, manhole, or subway for the purpose of making any tests on the electrical apparatus therein contained. For this purpose he shall have duplicate keys of all manholes, public or private, in the District.

8. *Repairs must be made.*

Each company or individual using electrical appliances in the District of Columbia is to keep its appliances in perfect repair and up to the requirements of these rules and regulations.

When any repairs, alterations, or changes in the electrical appliances of any company, corporation, or individual, to bring the same within the rules and regulations, shall have been ordered by the District electrician and due notice served on the said company, corporation, or individual to make such repairs or alterations, the District electrician shall have power, at his discretion, to make such repairs or alterations and charge the cost of the same to said company, corporation, or individual.

C.—OVERHEAD CIRCUITS IN GENERAL.

9. *Wires must be put underground, except, etc.*

No permits to place wires overhead shall be given by the District electrician unless the same or equivalent service can not be rendered by wires in the public conduits, or the company applying for the permit owns no conduits of its own at the given place.

In such case the system of distribution across housetops is to be encouraged both for the first and second class of conductors.

For the telegraph service the distribution is to be entirely underground in the public conduits and no permits for private conduits are to be issued.

The telephone system is to be carried in its own conduits where the latter exist. But no further permits are to be given the company to extend their system. All further connections are to be made through the public system, the wires passing underground until they pass into or up a house, or enter an alley where distribution can be made from a pole in the center of a block.

Telegraph and telephone wires may also enter houses or pass up their sides to the roof, and from thence to other houses of the same block.

Wires can only be passed overhead from one block to the next by special permit from the District electrician, but in no case shall more than four blocks be connected with one underground outlet.

10. *Removing and placing of poles.*

On and after ——— no poles shall be erected in the city of Washington and Georgetown except by order of the District electrician.

Such poles are to be put in position and maintained at the expense of the District, and a rent charged for their use by others. This rent is to be fixed from time to time by the Commissioners of the District, on the advice of the District electrician. Poles erected previous to that date in the public streets or grounds by private individuals or corporations, in positions where the same or equivalent service, in the opinion of the District electrician, can be rendered by the public or private conduits, shall, after a notice to that effect by the District electrician, be declared public nuisances, and shall be reported as such to the District attorney.

It shall then be the duty of the District attorney to proceed against such persons in the ——— court for the abatement of such nuisance.

The person or corporation owning such poles shall be subject to such penalty as the court shall prescribe, such penalty to be not less than $1 and not more than $5 per pole for each and every day it is maintained in violation of the law.

From the moment the District electrician has reported any pole as being a public nuisance, until the courts have decided the question adversely, no lineman or other representative of the owner, or the owners themselves, shall approach such pole to make any alterations or repairs whatever, except to remove the same. In the latter case he must have a permit from the District electrician to make such removal, which permit is to be produced when demanded by any police officer or official representative of the District electrician.

In special cases the poles or wires may be removed by order of the District Commissioners.

11. *Crossing of pole circuits.*

Where wires of the two classes cross each other, special care is needed.

The uppermost wires must cross the others by as short a span as possible, and special care must be taken to place them strongly, so that there is no danger of their falling on those below.

Where possible, a pole is to be placed at their point of crossing, the conductors of the second class being above. Where the pole is of metal securely grounded, no danger will result from the proximity of the wires, but where it is of wood, special precaution must be taken to wrap the upper part of the pole and cross-arms with wire of large size securely grounded by attachment to the nearest gas or water pipe or a plate buried in moist earth by a conductor equivalent in resistance to a section of iron of one-tenth of a square inch, so that any leaking current may be immediately carried to ground.

12. *Arrangement of poles.*

Poles carrying the two classes of wires shall not occupy the same side of the street, neither shall they cross each other except by the method given in Regulation No. 11 above.

Neither shall two lines of poles carrying wires of a similar class be erected on the same street or avenue. When wires of both classes pass down the street, they must occupy the opposite sides of the street on a separate row of poles.

13. *Quality of poles.*

Poles must be of a neat pattern, properly painted, and uniformly spaced at the rate of forty or more to the mile, except where two lines of different classes cross, when the distance must be as small as possible. In the case of telephone or telegraph wires, spans of 200 feet may be allowed in some cases.

14. *Placing of new poles or attachments.*

Application for the placing of new poles, or adding any new attachment to the poles already in place, public or private, is to be made to the District electrician in writing on a suitable printed form, and permission is only to be granted in situations where the service can not be done by underground wires in the public conduits. The District electrician is to be the judge of such possibility.

15. *Power of removal.*

The District electrician may remove any of the public poles, after due notice to those using them, and the said users of the poles shall receive no compensation for such removal.

D.—PUBLIC CONDUITS.

16. *Use of public conduits.*

The public conduits are specially constructed for telegraph and telephone wires, but there is no reason why they should not be used to a limited extent for wires of the second class when the latter are placed there under the proper restrictions.

17. *Blanks to be prepared.*

The District electrician shall prepare suitable printed forms for the use of those who wish to place wires in the public conduits or who wish to have poles erected at any new points or to make any attachments thereto.

18. *Applications to use public conduits.*

Applicants for the use of the public conduits will be required to enter into a written contract for their use, together with a sufficient guaranty of its performance.

19. *Entrance to manholes.*

The manholes of the public conduits are only to be entered after application to the District electrician and in the presence of an inspector detailed by him.

20. *Attachments and repairs.*

All attachments or repairs to lines on the public poles or cables in the manholes are to be made only by such linemen as are authorized by the District electrician, and are provided with a suitable numbered badge and a permit from the District electrician.

21. *The conduits under control of the District electrician.*

The arrangement of cables and joints in the public conduits or wires on the public poles is to be made according to instructions from the District electrician, who has power to order any changes to be made by and at the expense of the lessees.

22. *No dangerous cables to be used.*

No cables of the second class which are considered to be dangerous to the telephone and telegraph wires therein contained are to be permitted in the public conduits.

The District electrician may require the outgoing and incoming conductors of circuits to be laid side by side in the same duct or neighboring ducts, but this is not considered necessary where a metallic circuit is used for the telephone wires.

23. Cables of high class only to be used.

Cables of the second class to be laid in the public conduits must be of high class and approved by the District electrician. The initial insulation with all joints made and laid in the conduits, but without connections, shall not be less than 10 megohms per 100 volts per mile, and it shall never fall below 3 megohms per mile per 100 volts.

24. Danger of cross circuits and leakage to other wires must be avoided.

No cables carrying above 500 volts are to have the outgoing and incoming conductor in one cable in any of the public conduits or in any building not owned by the company using it, but only in private conduits or subways or in such positions as may be permitted by the District electrician.

All cables of the second-class in the public conduits are to be lead-covered and the covering grounded at every manhole.

25. Appliances to be obtained.

All persons using the public conduits must provide themselves with proper apparatus for pulling in or taking out its cables without damage to the conduits, and they shall be responsible for all damages resulting from carelessness or willful neglect.

E.—HIGH POTENTIAL CIRCUITS.

26. No limit to voltage.

No limit to the voltage or quantity of current is to be made when the same is properly regulated and controlled to prevent danger to life or property, and is constantly tested in accordance with these rules and regulations.

27. High potential wires to be insulated.

Overhead wires of class 2 are to be continuously insulated with durable and waterproof material to be approved by the District electrician. This insulation is to be carried to all portions of the circuit, including joints, and is to be kept in constant repair. So-called underwriters' wire is not to be considered satisfactory.

28. Special precautions.

No lines of the second class above 500 volts shall hang within 20 feet of the pavement at their lowest point except when a lamp connection is to be made, nor pass nearer than 10 vertical or 5 horizontal feet to any awning frame or other metallic conductor rising from the street, even for lamp connections, without special and careful insulation of the wire. Whenever there is chance of leakage to the iron frame or post, the latter is to be securely grounded. All joints must be as well insulated as the main line.

29. Wires must be properly attached to objects near them.

All wires passing within 4 inches of any fixed object must be attached to it by proper insulators unless supported within 10 feet of it by being attached to another insulator at that point, and the wires outside or inside the building must never, even when insulated, be in contact with any object, but always be separated from it by an approved insulator.

30. Metal poles to be grounded.

Every metal pole or structure having conductors attached to it by insulators and carrying currents above 300 volts in potential must be securely grounded by

being attached to gas or water pipes or a plate buried in moist earth, by a wire equal to one-tenth of a square inch of iron in resistance, so that the ground resistance is less than 10 ohms at all times and states of the weather.

31. *Dangerous wires to be painted red.*

Wires carrying currents at a potential above 500 volts are to be painted a bright red by the persons or company owning them wherever visible, as a signal of danger, and the lead covering of such cables in public manholes are also to be so painted. The outside of grounded metal tubes carrying wires inside of buildings need not be so painted inside the building, but the outside insulation of the wire must be so painted.

32. *Ground detectors to be used.*

All circuits are to be furnished either with a continuous ground detector or one that can be used every hour, and observations are to be made at least every hour. If a ground is detected and can not be remedied within five minutes, the current must be shut off until insulation is restored. In case it is continued beyond that limit the company shall be liable for all damage to life and property resulting from such continuance as well as for the breaking of these rules.

A daily test of the total insulation of the circuit with all attachments is to be made by the owner of the circuit and, together with the working of the ground detector, is to be reported daily to the District electrician.

The insulation of the whole circuit with all its connections, including dynamos and motors, shall never be less than 100 ohms for each and every volt of potential.

33. *Arc lamps to be made safe.*

All arc lamps in public positions are to be placed with their lower part at least 8 feet above the pavement or floor and all connections are to be placed out of reach of accidental contact.

All parts of arc lamps in the circuit and liable to be handled shall be insulated or protected by a grounded metal frame.

The arc lights are always to be inclosed in glass globes surrounded with wire netting.

34. *No great leakage from circuits allowed.*

The insulation of all circuits of the second class is to be maintained as follows:

If any circuit, overhead or underground, in private or public conduits, with all attachments or connections and with full current flowing, is grounded at any point the current escaping must be less than one-twentieth of an ampère. The District electrician has power to make this test or order it made on any circuit at any time, and he has also power to remove the insulation from any wire at any time to make the proper connection, notice being given to the company after the test to close the opening at their own expense. But this power is only to be used in rare or exceptional cases.

The District electrician shall have the power to order ground detectors, continuous or otherwise, to be located at any portion of the circuit he may think desirable.

The insulation must be approved by the District electrician, and for overhead wires be at least 2 megohms per mile per 100 volts.

For underground cables in private conduits no tests of the cables by themselves need be made, but only after all the connections are made as above.

35. *Companies must provide themselves with testing apparatus.*

Every electric light or power company doing business in the District of Columbia shall provide itself with such instruments for electric testing as are considered necessary by the District electrician, and they shall be located at such places and shall have such connections as the District electrician shall consider necessary for the protection of life and property and the carrying out of these rules and regulations.

36. *No earth returns allowed.*

All circuits of the second class must be entirely metallic and no earth connection must be used for lines situated within the limits of the city of Washington. Special permission to use the earth for the return circuit can only be given to telephone and telegraph companies and to street railways using the trolley system, and even then only under special circumstances, after due consideration of the rights of the telegraph and telephone companies.

37. *Motors and dynamos carefully placed.*

Electric motors or dynamos must not be placed in positions where there is escaping gas or vapor or fumes of any inflammable substance or inflammable dust, as the sparks at the commutators may cause an explosion.

38. *Current must be shut off to make repairs.*

No repairs or alterations to apparatus, wires, or cables carrying over 500 volts are to be made while the current is on.

39. *Metal frames of dynamos and motors to be made safe to life and property.*

The metal frames of all dynamos and motors working with currents above 500 volts situated in any place otherwise than central electric-light stations are to be securely grounded. All parts of such motors connected with the circuit which can be touched with ease are to be covered with insulating material or so protected by metal screens attached to the frames that there is no possibility of accidental contact. The rules for internal wiring are to apply to this case and the wires conveyed in grounded metal tubes or on insulators in covered channels until they are beyond reach of accidental touching.

The metal frames of motors and dynamos running with currents below 500 volts are to be either well insulated or grounded, especially if there is danger of damp or water.

All dynamos in central electric-light stations connected with circuits above 500 volts are to have their frames insulated from the ground.

40. *Converters must be made safe to life and property.*

Converters used with circuits above 500 volts are to either have their secondary or low potential circuit securely grounded or to have a grounded sheath between the primary and secondary. They must also be furnished with proper safety plugs in both circuits.

When they are situated within the building the entering wires must be put in according to Regulations Nos. 41 and 42, and the outside case must be of metal, securely grounded. All parts of the instrument and the entering wires must be covered with metal securely grounded, so that it is impossible for any person to touch the primary wires without removing part of the metal covering.

F.—WIRING OF BUILDINGS, ETC.

41. *Wires must be insulated.*

All wires of the second class in buildings are to be covered most carefully from end to end and at the joints with durable insulating material which does not become very soft at 150° F. In situations where there is any liability to dampness the insulation must be waterproof. The whole is to be covered with durable covering of tape, thread, or woven material, and the thickness is to be proportioned to the potential. Bare wire inclosed in wood is not to be used, neither so-called "underwriters' wire."

In passing around the building the two wires must be 1 foot apart for 1,000 volts and in proportion for other potentials except for constant potential systems with safety plugs, when the wires can be twisted together and placed in the tubes or channels of noninflammable material, provided the current does not exceed 10 amperes.

42. *Entrance into and passage of high-potential wires through buildings.*

Wires of the second class above 300 volts entering buildings must be at least 1 foot apart for each 1,000 volts potential. They must have a thickness of approved waterproof insulation of at least one-tenth of an inch for each and every 1,000 volts of potential for at least 5 feet before entering the building and continuing within the building to a point where the wires are so high above the floor or so far distant from any danger of contact that there is no danger to life or property. The insulation may then be reduced to one-half the above thickness.

The passage through all partitions or walls is to be made by the wire with thick insulation laid in incombustible insulating tubes.

The insulated wires are to be supported on insulators near together and laid in boxes, wooden or of nonconducting in combustible material, at least 3 inches square on the inside, with a glass cover to render the interior visible. The boxes are to be suitably ventilated. These boxes are to be carried to all points within which the wires can be touched by a cane 3 feet long in the hands of a tall man in such positions as he would usually occupy. Beyond and above that point the insulation may be of the thinner variety, and the wires suspended freely in the air, tightly stretched on insulators.

43. *Entrance of low-potential wires and passage around buildings.*

Low-potential conductors below 300 volts are entirely safe to touch or handle, and need only to be carried through the building in such manner as to avoid all danger of fire.

They are to be furnished at the entrance into the building with safety plugs, as in Regulations No. 47. They may enter the building side by side, or, when not carrying more than 10 ampères, may be twisted together. In the latter case they should be inclosed in a tube, metal or otherwise, which should be fireproof. Should they pass through a cellar or any damp or cold place the wires should have special waterproof insulation or the whole interior of the tube should be filled with insulating compound, or, best of all, two nonconducting waterproof and fireproof tubes should be used, one for each wire.

In passing through dry parts of the building the wires, properly insulated, may be run parallel to each other about 1 inch apart for 100 volts and in proportion for higher volts. They may be covered with a wooden cleat, provided they are laid in grooves in a solid piece of wood whose pores have been filled with an insulator and there is half an inch of wood between the wires. This construction is not to be allowed in damp or cold places or any situations where damp or water may wet them and the surface on which they rest. In such cases waterproof insulation must be used or the wires inclosed in separate insulating water and fireproof tubes, or, when not carrying more than 10 amperès, they may be twisted together in such tubes.

Tubes that continue to burn after being held for five minutes in the flame of a gas-burner are not to be considered fireproof.

44. *Wires of first class.*

Wires of the first class are perfectly harmless by themselves and can be placed in buildings in any manner, the only care needed being to place a proper lightning arrester when they are connected with an overhead system and to remove them from all danger of contact with wires of the second class. Where there is danger of the latter some protective device to prevent heavy currents entering should be adopted.

45. *Wires must be accessible.*

All wires, especially for high potential currents, must be placed in easily accessible positions, and it is best to have the tubes and wires clearly in view throughout their whole length.

46. *Size of wires.*

The wires must all be of sufficient size to carry twice the current without more than a slight heating. One thousand ampères to the square inch of copper is considered safe in most positions, especially for small wires not too closely in

closed. Two thousand ampères to the square inch is often safe for small free conductors.

No naked conductors carrying currents above 50 volts are to be allowed in any building and even then only in exceptional circumstances.

47. *Cut-off and safety fuses.*

Every line of second class entering a building shall be controlled by a suitable cut-off near the entrance, in sight and easily accessible.

In the case of so-called constant potential systems and transformer systems a suitable safety fuse or its equivalent must be used in each branch of the circuit at the entrance to the building and at all places where a change in the size of wire occurs to cut off the current on the occurrence of a short circuit.

48. *Switches, etc.*

Switches, resistances, commutators, and cut-outs must be mounted on incombustible bases in such places as to avoid all danger of conflagration. Wood, properly treated, can be used. All attachments to the same are to be easily accessible and, in case of circuits above 300 volts, their parts so arranged by the use of insulators or grounded metal screens that there is no possibility of accidental contact. In case connections are made at the back, the same must be easily accessible and not placed against a wall or other object where a concealed fire may form.

In case they have a metal frame it must be securely grounded for circuits above 300 volts.

49. *Lightning arrester.*

A lightning arrester of approved form must be placed at the entrance of every overhead wire into a building, and connected with one or more securely grounded wires of large size.

G.—GENERAL RULES.

50. All existing regulations of the local authorities in regard to the placing of poles, stringing of wires, etc., are to continue in force unless in conflict with these regulations, in which case they are superseded.

51. The District electrician shall be the interpreter of the meaning of these rules and regulations, and shall be the judge of whether any wire, cable, insulator, or other electrical appliance or apparatus is made or arranged according to them.

52. Any changes in these rules and regulations are to be made by the Commissioners of the District after recommendation by the District electrician.

H.—PENALTY.

53. In case any company, corporation, or individual shall willfully violate these rules and regulations or neglect to comply with them after due notice by the District electrician he or they shall be subject to a fine of not less than $5 or more than $50 for each and every day of such violation.

APPENDIX.

Papers relating to the District of Columbia, together with the Evidence from Mr. Allen and Mr. Preece as to the Practical Working of the Multiplex Telegraph on Underground Circuits.

WESTERN UNION TELEGRAPH COMPANY.

LETTER FROM MR. MAREAN TO THE COMMISSION.

WESTERN UNION TELEGRAPH COMPANY,
Washington, D. C., June 3, 1891.

GENTLEMEN: I respectfully submit the following reply to the inquiries contained in your letter of January 22, 1891.

(1) My connection with the Washington office of the Western Union Telegraph Company and its predecessor company has been almost continuous for the past thirty years, during the greater part of which time I have had more or less to do with the wires radiating therefrom, and I do not hesitate to say that, for general telegraph service, overhead wires are superior in every respect to those placed under ground; and especially so for any of the various systems of multiplex transmission now in general use, the instruments of which require careful and sometimes frequent adjustment by experienced and careful men, and on which the greater retarding influence of underground wires causes more serious interference. While perhaps the former are subject to more frequent interuptions, they admit of easy and prompt repair, and only on rare occasions are interruptions so serious as to cause any material delay in handling business; and the average length of life of overhead plants has been several times that of underground. My experience with underground systems is briefly set forth in my letter to Maj. Raymond, Engineer Commissioner of the District of Columbia, printed in Senate Mis. Doc. No. 15, Fiftieth Congress, second session, to which you are respectfully referred.

(2) The Western Union Telegraph Company has approximately 500 miles of overhead wires in the cities of Washington and Georgetown, and about 6 miles of underground, all of the latter being located in the Capitol grounds.

(3) The short sections of cable now in use through the Capitol grounds consist of "bunched" cable, each containing from 16 to 20 No. 14 copper conductors, cotton covered, saturated with an insulating compound, protected outside with a lead covering, making an entire diameter of about 1¼ inches, and laid in round 6-inch terra cotta pipe. These cables have been laid within the past three years, to replace others, both of similar and of various kinds of rubber insulation which had failed. There has been little or no difference as to insulation and durability in the several kinds of cable used, the life of each averaging about five years.

(4) Cables containing from five to twenty wires each, in a subway large enough to admit workmen would seem the best underground system for the telegraph service. Where such subway is not practicable, pipes of durable material with a perfectly smooth inside surface, buried to the depth of not less than 2 feet and connecting at intervals of about 200 feet with large working boxes, would seem the next best substitute.

(5) My only experience with multiplex systems on part overhead and part underground wires is given in my letter to Maj. Raymond previously referred to.

(6) The effect of excessive retardation on the Morse, and also on the duplex and quadruplex systems, which are in general use in this country, has a tendency to cause a frequent failure in the reception of signals in the receiving instruments, as well as decreased speed. I am not aware that any experiments to determine the relative retarding influence of underground and overhead wires, so far as it affects the speed of transmission, have ever been made on telegraph circuits in this country. Published reports of tests of this character, made on the automatic system some years ago in Europe, gave, as the result, a decrease of one word per minute for each mile of underground inserted in an overhead circuit.

(7) Retardation in underground wires is many times greater than that of overhead wires, but under ordinary conditions the retarding effect of a mile or two of underground wire in a circuit of 200 or 300 miles of overhead wire would probably not be sufficient to cause decreased capacity in multiplex systems. Duplex and quadruplex circuits of from 1,000 to 1,500 miles with intermediate repeaters, and from 400 to 600 miles without repeaters, are in operation, and the retarding effect of any considerable amount of underground wire in such circuits would undoubtedly cause a material decrease in capacity, if not total failure, and I know of no way to effect a remedy.

(8) The limited amount of underground wires used for telegraph service in this city are copper conductors about one-sixteenth of an inch in diameter, with insulation varying from one to three thirty-seconds of an inch in thickness.

(9) Retardation increases with the size and length of the wire and diminishes in proportion to the thickness of insulation, or the distance by which the wire is separated from contact with the earth; therefore enlarged wires with thicker insulation would effect no material improvement.

(10) I think it utterly impracticable to insulate a conduit, because inside condensation is inevitable, and I fail to see any advantage in attempting it, as conductors in any underground service must be so thoroughly insulated as to be impervious to moisture.

(11) I do not consider it expedient or advisable to place all wires used for electrical service in the same conduit on account of interference to the telephone service by induction from other wires, and danger of fire, and to life, which is liable to result from contact of electric-light wires with either telephone or telegraph wires.

(12) It would seem quite necessary that a telegraph company having a large number of wires used in local and through traffic should have separate ducts or separated space in subways for its wires, that the company's agents might have absolute control of repairs and renewal.

(13) The map already furnished showing location of lines and offices in the city will indicate the routes necessary in an underground service, though greater concentration might be possible.

(14) I think the Western Union Company would prefer owning and controlling its own ducts, as its business is too large and important to be dependent upon other agencies for its facilities.

(15) I am not prepared to express a preference for any particular form of conduit.

(16) I think any underground system to be reasonably satisfactory must admit of easy access to or ready removal of its cables for their prompt repair and renewal. The delay incident to locating faults and repairing or renewing cables imbedded in solid insulation would make such a system highly objectionable.

(17) The overhead lines in the city average about forty poles per mile and the number of wires per pole vary from ten to seventy-five, and the cost will probably average $100 per mile. It is estimated that the cheapest underground system complete will cost about four times as much.

Whatever of additional information I might be able to give is embodied in letters of Mr. E. L. Bugbee and myself, printed in full in Senate Mis. Doc. already referred to, and which I desire to be incorporated as a part of this communication.

Very respectfully, yours,

MORELL MAREAN,
Manager.

The ELECTRICAL COMMISSIONERS,
Washington, D. C.

The following are copies of letters referred to in Mr. Morell Marean's communication above:

LETTER FROM MR. MAREAN TO MAJ. RAYMOND.

OFFICE WESTERN UNION TELEGRAPH COMPANY,
Washington, D. C., October 10, 1888.

DEAR SIR: In reply to your communication, under date of July 21, I would state that the experience of the Western Union Telegraph Company with underground wire service in this city has been confined to the wires through the Capitol grounds. Those entering the Capitol through the south grounds in iron and terra-cotta pipes have been renewed four times in the past fifteen years, the average life of the insulation (best gutta percha) having been about four years. The present cable of nineteen conductors was laid in January, 1887, and five of the nineteen wires have already given out, by reason of failure of the insulation. The Mutual Union Company, when absorbed by the Western Union Company in 1883, had twenty or more insulated wires laid in iron pipes for a distance of about a mile under New York avenue and North Capitol street; some parts of it had been renewed two or three times in as many years, and all was taken up in August, 1883, having entirely failed. The wires of the Baltimore and Ohio Telegraph entered the Capitol building through the conduit from North Capitol and F streets, with two lead-covered cables of six wires each, which were laid in 1885. A test of these wires just previous to the opening of the present session of Congress developed the fact that the insulation of six of them had failed. The causes of these failures are various. In some cases the insulation had apparently deteriorated by reasons of varying conditions of humidity and temperature; in others lightning had entered and perforated the insulation, though protected by double arresters; in still other cases the insulation was completely rotted off in places, apparently by action of iron rust, or similar attacking substance; and, so far as I am informed, the experience of the company with underground wires here has been similar to that at other places.

It is highly important that wires, if buried, should be practically as accessible as in the present air lines, and to this end it would seem that a suitable subway, not less than 6 feet in diameter, large enough for workmen to enter and pass through readily, with shelves or supports on each side to carry insulated wires, either single or cabled, would come most nearly to meeting the requirements of the service.

It is estimated the cost of such a subway, with outlets, traps, etc., would be from $60,000 to $100,000 per mile, and its construction should be at the expense of the District government, as no telegraph company could afford to make this great outlay without very largely increasing its rate of charges. The increased cost of construction and maintenance would also compel the abandonment of a majority of the branch offices in this city, maintained now exclusively for the convenience of its patrons at an expense of over $1,000 per month.

During periods of wet weather, especially in the spring and fall, when the atmosphere is thoroughly saturated with moisture, great difficulty is experienced in working long circuits on account of a leakage of the current to the earth, and the capacity of all such circuits is reduced fully 50 per cent from this cause. My experience justifies the assertion that the introduction of a limited amount of underground wire at such a time would add a further element of weakness sufficient to cause frequent total failure. The amount of underground wire that may be worked in the ordinary Morse, the rapid, or the multiplex systems, without interference or causing a decrease in speed or capacity, can be determined only by actual experience under all the varying conditions to which a telegraph line is subject. Experiments made by myself, some four years ago, with the printing and Morse quadruplex systems through 15 miles of underground wire inserted in an air-line circuit of 300 miles, proved a total failure, because of an apparent excessive retardation that prevented the charge and discharge of the line with the rapidity and regularity necessary to the success of these systems, the static induction of 1 mile of the underground wire being equal to that of 150 miles of the overhead wire.

Wires used in carrying low-tension currents for incandescent lights or motors might be placed in the same conduit with telegraph wires, but telephone wires and high-tension or arc-light wires would each require a separate and independent conduit, on account of interference by induction to the former, and both induction and danger from the latter.

The present efforts of elective inventive genius, as applied to telegraphy, are toward increasing the carrying capacity of each wire, as the most practical method of improving and cheapening the service. The placing of wires under ground is apparently a move in direct opposition to the attainment of this effect. Better conductors, with improved insulation, raised higher from the surface, are absolutely necessary to the permanent success of many improved systems over present methods. There should be no objection to the maintenance of overhead lines on the purely business streets and the lines of the steam railways within the city, if placed high enough to avoid interference with the operation of the fire department.

Herewith is submitted a map showing the present location of pole and other lines owned and operated by the Western Union Company, together with its main and branch offices, in the city, and also one showing the routes of subways necessary to serve the same offices by an underground system. Besides this there is a system of wires for the Mutual District Messenger service, operated in connection with the Western Union Company's offices, consisting of single wires running into nearly every block in the city, which it would be impossible to place underground to any considerable extent, as its patrons would not submit to the increased cost.

In conclusion I would say, that while some advance has been made in the construction of conduits or subways, no marked improvement has been made in the last twenty years either in the character or durability of the insulation of wires. Of the large number of patented or other so-called perfect underground systems not one, after a fair trial, has proved even reasonably successful in the telegraph service. Admitting the desirability of burying the city wires at as early a date as possible, it is not equitable or just to compel a telegraph company to jeopardize its means of conducting the business of the Government and the public, or to confiscate its property in overhead wires which have been erected by express authority of law until a system has been devised that can be safely depended upon.

I submit also a paper on the subject by Mr. E. L. Bugbee, of our office, who has had many years' experience in the management of wires in this city.

Very respectfully,

MORELL MAREAN,
Manager.

Maj. CHARLES W. RAYMOND, U. S. Army,
Engineer Commisssioner, District of Columbia.

LETTER FROM MR. BUGBEE TO MR. MAREAN.

OFFICE WESTERN UNION TELEGRAPH COMPANY,
Washington, October —, 1888.

DEAR SIR: Before taking up the points specially mentioned in Maj. Raymond's communication, I wish to say, to borrow the words of a member of the New York subway commission, in a discussion of the subject at a meeting of the New York Electric Club some weeks since, that "I am convinced that the overhead-wire nuisance has been greatly exaggerated."

And, I will add, that in my opinion the matter of overhead wires has not received that intelligent and systematic consideration, with a view of regulating and reducing the objectionable features, which it should have before proceeding summarily to remove them. I desire, also, to quote from authorities on this subject, some facts upon which subsequent conclusions are based:

(1) Dry air is the only known perfect insulator, which is the best possible reason for suspending wires in the air.

(2) The speed of the electrical current through aërial wires is hundreds of thousands of miles per second, while in submarine or underground wires it is reduced to barely 1,000 miles (varying with the capacity of the conductor and the thickness of the insulation), and the velocity can not be increased by increasing the strength of the current.

(3) The retardation of the current, or induction from the earth surrounding an insulated conductor of a given length, increases inversely as to the thickness of the insulation.

(4) The rate of speed decreases as to the square of the length of the conductor

In aërial lines the conductors are so far removed from the earth as to be but comparatively little affected, but when it is considered that this same inductive principle is the foundation and source of all machine currents, which may be made as strong and dangerous as lightning itself, it will be readily understood why, on a conductor of the length of an ordinary telegraph circuit separated from the earth by an insulation of only an eighth or quarter of an inch thick, its effect is such that the multiplex systems can not be availed of, and even the common Morse has to be abandoned for the more delicate and slow needle system on lengths of upward of 300 miles.

Having had but limited experience with cables, I will pass that point with only one reference. In the use of the automatic system by the Automatic Telegraph Company, about fourteen years ago, a speed of transmission of over six hundred words per minute was attained between Washington and New York. It was noticed that the writing was not as clearly recorded at New York in receiving from Washington as at Washington from New York, and the conclusion was that the short lengths of cables across the Hudson and other rivers near New York made the difference, there being no cables on the Washington end.

As to the kind of conduit, it is probable that one which would be large enough for men to pass through and which, if possible, would be free from water, would be likely to give the greatest amount of satisfaction (or dissatisfaction).

The cost would probably be considerably more than for a sewer of the same size, but as I am not familiar with that kind of work, I can not even approximate the expense.

As there are now a number of interests to be considered besides the District and the General Government service, and undoubtedly there will be others in the future, and in order that the multiplicity of underground systems may not become an alleged greater nuisance than the present overhead system is, it would seem proper that such conduits should be made at public expense and occupied as tenants at a reasonable rental by such corporations or individuals as may need to carry wires along the streets where they are.

The difficulties in working underground electric systems have already been rather briefly stated, but I will add something as to the effect, prefacing my further remarks by this thought: If overhead wires are a nuisance and must go in Washington, they are also a nuisance in Alexandria; and if in these cities, then also in New York, Newark, and a dozen or twenty other cities that trunk lines from New York to Washington and the South and West pass through.

If the underground is generally insisted on, I see no way for the telegraph companies but to stay outside with their trunk lines and run only local or branch lines into the city, thus depriving the city of many of the direct connections now enjoyed, as I am of the opinion that the interposition of any considerable lengths of underground will render useless the multiplex systems as now used on most of the circuits which carry the bulk of the business.

I know of no reason, so far as the telegraph is concerned, why telephone wires should not occupy the same conduit, but I can not vouch for the telephoners. One can scarcely hear his friend now sometimes for the noise from other wires, and is liable to be almost deafened by the ringing of a bell in some contiguous wire, and I can only imagine the racket produced by the varying currents of a quadruplex wire in close proximity to a telephone wire.

Yours respectfully,

E. L. BUGBEE.

Mr. MORELL MAREAN,
Manager Western Union Telegraph Company.

DATA RELATIVE TO THE SERVICE OF THE COMPANY IN THE DISTRICT OF COLUMBIA.

LOCATION OF OFFICES.

Main office: Corcoran building, southeast corner Fifteenth and F streets NW.

Branch offices: Baltimore and Ohio station, New York avenue and Boundary NE: B street, near the corner of Second SE.; Capitol (three offices); Baltimore and Ohio depot. New Jersey avenue and C street NW.: Baltimore and Potomac depot, Sixth and B streets NW.; Metropolitan Hotel, Pennsylvania avenue, between Sixth and Seventh streets NW.; Post-office Department; Seventh street,

between P and Q streets NW.; southwest corner Ninth street and Pennsylvania avenue NW.; Ebbitt House, southeast corner F and Fourteenth streets NW.; Willard's Hotel, Pennsylvania avenue and Fourteenth street; Riggs House, Fifteenth and G streets NW.; Arlington Hotel, Vermont avenue, between H and I streets NW.; The Normandie, northwest corner Fifteenth and I streets NW.; The Arno, Sixteenth street, between I and K streets NW.; Fourteenth street, between P and Samson streets NW.; 1114 Connecticut avenue, between L and M streets NW.; Twelfth street wharf; in Georgetown, Thirty-second (High) street, between M and N streets.

ROUTES AND DESCRIPTION OF LINES.

From main office, corner Fifteenth and F streets NW., on west side of Fifteenth street from Pennsylvania avenue to B street, 9 6-wire arms, 48 wires;

B street, from Fifteenth to Seventeenth, and Seventeenth street to C street, 4 10-wire arms, 41 wires;

Seventeenth street from C to G streets, 3 6-wire arms, 18 wires;

C street, from Seventeenth to Twenty-third, Twenty-third to E, to Twenty-fifth, Twenty-fifth to Virginia avenue, 4-wire arms, 40 wires;

Twenty-fifth street from Virginia avenue to M street, 1 10-wire arm and 2 brackets, 12 wires;

Virginia avenue from Twenty-fifth to Twenty-ninth street, Twenty-eighth to K, to Rock Creek, 3 10-wire arms, 28 wires;

K street, Georgetown, from Rock Creek to Thirty-second street, and Thirty-second to M, 6-wire arms, 28 wires;

M street from Thirty-second to Thirty-sixth, new free bridge, 6-wire arms, 24 wires;

On east side of Fifteenth street from Pennsylvania avenue to B street, 12 6-wire arms, 50 wires;

B street from Fifteenth to Fourteenth, 5 10-wire arms, 50 wires;

B street from Fourteenth to Sixth street, 5 10-wire arms, 46 wires;

Sixth street from B street N., to C street S., and C street to South Capitol street, 4 6-wire arms, 20 wires;

On Pennsylvania avenue, from Fourteenth to Thirteen-and-a-half and on Thirteen-and-a-half to C street, 7 8-wire arms, 59 wires;

Thirteen-and-a-half street from C to B street, on B street to Fourteenth street, and on Fourteenth to the Long Bridge, 3 10-wire arms, 30 wires;

C street from Thirteen-and-a-half to Ninth street, 4 8-pin arms, 33 wires;

C street from Ninth to Four-and-a-half, alley between B and C from Four-and-a-half to First; First to C and C from First to Baltimore and Ohio depot, New Jersey avenue, 3 8-wire arms and 2 brackets, 26 wires;

On C street from Baltimore and Ohio depot to North Capitol street, and on North Capitol to B street, 3 8-wire arms, 11 wires;

On Fifteenth street from F street to Pennsylvania avenue, and on Pennsylvania avenue from Ffteenth to Fourteenth street, 4 6-wire arms, 12 wires;

On Fifteenth street from F to G street, 10 8-wire arms, 76 wires;

Fifteenth street from G to I street, 3 6-wire arms, 9 wires;

G street from Fifteenth to Seventh street, 9 8-wire arms, 73 wires;

Seventh street from G to C street, 3 8-wire arms, 24 wires;

C street (north side) from Sixth to Sixth and Sixth to B street, 4 6-wire arms, 24 wires;

Seventh street from G to New York avenue, 9 8-wire arms, 69 wires;

Seventh street from New York avenue to Boundary and on Boundary to Eighth street extended, 4 8-wire arms, 32 wires;

New York avenue from Seventh to North Capitol street, 5 8-wire arms, 37 wires;

North Capitol street from New York avenue to Boundary, 3 4-wire arms, 12 wires;

New York avenue from North Capitol to Boundary and Boundary to Baltimore and Ohio Railroad, Ninth and L streets NE., 4 6-wire arms, 24 wires; and

Boundary from Baltimore and Ohio Railroad to Maryland avenue NE., 3 6-wire arms, 18 wires.

WIRES ON OTHER COMPANIES' POLES AND HOUSETOPS.

Baltimore and Potomac Railroad from depot to Eastern Branch;

Baltimore and Ohio Railroad from depot to Boundary (both branches);

outh Capitol and C to Second and B streets, SE.;
hirteenth street, NW., from D to D streets;
street from Thirteenth to Seventeenth streets, on Seventeenth to De Sales
ets to Connecticut avenue;
ourteenth street from L to P streets;
street from Fourteenth to Thirteenth streets;
street from Thirteenth to Seventh streets;
street from Sixth to Fifth street; on Fifth street from Washington street
alleys to Government Printing Office; and
ighth street, SE., from Virginia avenue to Navy-yard.

GOVERNMENT AND NEWSPAPER OFFICES, ETC., HAVING CONNECTIONS.

avy-yard; Agricultural Department; National Museum; Bureau of Engrav-
and Printing; Government Printing Office; Census Office, northwest corner
rd and G streets NW.; Pension Office; Interior Department; Post-Office De-
tment; Treasury Department; Department of Justice; Executive Mansion;
te. War, and Navy Department (three offices); Signal Office, Twenty-Fourth
M streets NW.; Naval Observatory; Richmond and Danville Railroad, gen-
l offices, southwest corner Thirteenth street and Pennsylvania avenue; Ches-
ake and Ohio Railroad ticket office, National Hotel, corner Sixth street and
nsylvania avenue; Richmond and Danville Railroad freight office, Thir-
n-and-a-half and E streets SW.; Baltimore and Ohio Railroad ticket office,
ner Fourteenth street and Pennsylvania avenue NW.; The United Press Of-
, Fourteenth street, between E and F streets NW.; The Cincinnati Commer-
l Gazette office, Fourteenth street, between E and F streets NW.; St. Louis
obe-Democrat office, Fourteenth street, between E and F streets NW.; New
rk Tribune office, F street, between Thirteenth and Fourteenth streets NW.;
icago Inter-Ocean office, F street, between Thirteenth and Fourteenth streets
W.; Washington Evening Star office, northwest corner Pennsylvania avenue
d Eleventh streets NW.; Washington Evening Critic office, corner D and Tenth
eets NW.; Cincinnati Enquirer, north side F street, between Fourteenth and
ifteenth streets NW.; Cosson, Macartney & Co., brokers, north side F street,
tween Fourteenth and Fifteenth streets NW.; Crane & Co., brokers, north
de of F street, between Fourteenth and Fifteenth streets NW.; Reddington &
o., brokers, south side F street, between Fourteenth and Fifteenth streets, NW.;
. T. Havenner & Co., brokers, Atlantic building, F street, between Ninth and
enth streets NW.; Adams building, F street, between Thirteenth and Four-
enth streets NW.; Hodgen & Co., brokers, F street, between Thirteenth and
ourteenth streets NW.; Hodgen & Co., brokers, Le Droit building, Eighth and
streets NW.; Washington Commission and Investment Company, brokers, 635
street NW.; Lewis Johnson & Co., bank, Tenth and Pennsylvania avenue NW.;
Washington Flour and Feed Company, Virginia avenue, between Third and
our-and-a-half streets, SW.

LOCATION OF UNDERGROUND WIRES.

F street, from Corcoran building to Fourteenth street, to New York avenue, to
welfth street (not in use); South Capitol street, from C street to the Capitol
uilding; North Capitol street, from B street to the Capitol building.
The following have been abandoned: B street, from North Capitol to New Jer-
ey avenue; New Jersey avenue, from B to G and First streets; First street, from
to I streets.

UNITED STATES ELECTRIC LIGHTING COMPANY.

LETTER FROM MR. RENSHAW TO THE COMMISSION.

OFFICE OF THE UNITED STATES ELECTRIC LIGHTING COMPANY,
Washington, D. C., March 1, 1891.

GENTLEMEN: Your communication of February 9 was duly received, and we
ewith answer your interrogatories as far as we have the data at hand.
1) Our underground conduits extend from First street NW. west to the
rgetown free bridge, and from B street NW. north to Florida avenue. The

conduits extend through most of the important streets and avenues of the northwest section of the city, traversing more than 20 miles of streets and alleys.

We have furnished the District commissioners with a plat of said conduits, which exhibits the exact locality of every man or hand hole opening in conduit. Are informed at the District office that this map will be at your service when desired.

Three-fourths of all the territory we desire to reach is already covered by our underground conduits.

(2) We use various sizes of wires from No. 6 to No. 0000 B. W. G., also cables from No. 6 to 500,000 circular mils. The cables we now use are all lead-covered.

We have in use Standard cables, Western Electric, Cobb, Roebling's Sons, and Bishop gutta percha.

(3) In regard to size of cable, it depends entirely upon the purpose for which you design to use them; thus a No. 6 conductor is ample for arc lighting, while a 500,000 circular mils cable, or even larger, may be required for incandescent lighting or power purposes. The ducts should be made accordingly.

Ducts should always be rectangular to avoid friction in pulling in and out of cable, thus: A cable drawn into a rectangular duct has but one small point of contact, like a billiard ball on table, and glides in and out with least friction: while a cable in a circular duct presents a large proportion of surface for friction and binds accordingly.

(4) We have in use the arc system direct current of about 2,400 volts.

The alternating current for incandescent lighting, the primary current being 1,000 volts and the secondary current 55 and 110 volts, and a direct current of 110 volts for (Edison) incandescent lighting.

All of the street lamps are connected with underground cables in our conduits.

We do not wire public or private buildings for incandescent lighting; it is done by the consumers.

Before connecting a building with our street mains we inspect the wiring and if found to be done in accordance with the rules of the Board of Fire Underwriters, we make the connection, if not, the wiring is condemned, and service refused until the wiring is made to conform strictly to the rules.

(5) There are numerous advantages and disadvantages with both the overhead and underground systems of wiring.

It is an acknowledged fact that dry air is the best of all known insulators, and if there were no other factors to be considered, there could be no question but aerial lines are best adapted for the distribution of the electric current. But when we take into consideration the frequent interruption of electric business by storms and the various contingencies happening in the streets of large cities, it is, in our estimation, more disadvantageous to place the lines underground.

(6) If the cables are in proper condition there should be no more loss of electromotive force by underground than overhead service.

(7) A good underground system will probably cost from three to ten times more than an overhead system.

A good overhead system is expensive, while a poor one can be made at a trifling cost.

(8) We regard the extra outlay for an underground system fully warranted by the freedom from interferences caused by storms, fires, etc.

(9) We prefer a separate conduit of our own for various reasons:

(*a*) It is not desirable to be in a conduit used by other parties, as there would undoubtedly be unavoidable interference and increased risk:

(*b*) In a conduit by yourself you are subject only to your own regulations;

(*c*) We doubt the practicability of building a large conduit in this city on account of tide water.

We favor a small conduit of size sufficient only for use of each electrical company. Large conduits are dangerous from the accumulation of gas.

The failure of the New York conduit fully illustrates this.

(*d*) We do not believe it practicable to place telegraph and telephone cables in the same conduit with electric light cables; it would be a source of constant trouble.

(10) The best way to guard against the interference of signal circuits by high tension currents is to isolate them. They should not be in the same conduit.

(11) We have had slight explosions in our manholes, but our conduits are so constructed that the manholes are comparatively small and but a limited amount of gas can collect, thus our explosions are harmless. Large, roomy manholes and spacious underground conduits increase the risk from explosions from gas.

(12) As far as the conduit is concerned we do not regard that there is any danger to life or liability from fire.

The wiring of buildings is governed by the rules of the Board of Fire Underriters, and also the Edison Electric Light rules. The system for preventing fires, &c., is very complete, embracing safety fuses, plugs, etc. Would refer you to bove rules for description of system.

(13) The cost of overhead lines depends entirely upon the kind of line you may uild. We have no two miles of line alike in this city.

They may consist of incandescent lines or of arc; there may be one line or enty; they may be upon wooden poles or upon iron. Can give you no compreensive statement of cost of overhead lines without a description.

Our underground conduits are built by the Washington Electric Conduit Comny. The conduits are of glazed terra cotta with square ducts. They are furshed and laid complete at a stated figure per lineal foot, depending upon their e. Our conduits are laid immediately under the pavement, as near the surface possible to avoid gas and water pipes and to secure good drainage. The conduit laid upon a bed of concrete 3 inches thick; the sides and top are also incased in nches of concrete, and is thus made water-tight.

We have marked the cost of conduit per foot to the attached description. This st includes taking up pavements, excavating, laying conduit in concrete, reing and replacing all pavements, except those relaid by District authorities; so the building of all manholes and furnishing of castings and the cleaning up street, etc.

(14) At present time am unable to make up the data required under this secon.

(15) We herewith attach illustrations of system of conduits we have in use. ould say that during the last eight years we have tried various conduits and ave experienced great trouble with them. Our experience has been that conduits f iron, cement, and asphalts should be avoided.

The conduit we have adopted has been in use three years by us and answers ur purposes admirably; it is safe and durable.

Shall be pleased at any time to give you any further information possible.

Very respectfully,

A. M. RENSHAW,
General Manager United States Electric Lighting Company.

THE ELECTRICAL COMMISSIONERS,
Washington, D. C.

LETTER FROM THE COMMISSIONERS OF THE DISTRICT, GIVING PERMISSION TO EXTEND THE UNDERGROUND SYSTEM.

OFFICE OF THE COMMISSIONERS, DISTRICT OF COLUMBIA,
Washington, D. C., March 5, 1891.

Permission is hereby granted the United States Electric Lighting Company to lay underground conduits upon streets and avenues, as set forth below:

First street, west, from Pennsylvania avenue to B street, south; thence on said B street to Pennsylvania avenue, southeast; thence on said Pennsylvania avenue to Eleventh street, east, a distance of about 7,400 feet; and on Seventh street, west, from B street, north, to Water street; thence on Water street to P street, south, a further distance of about 7,250 feet; or a total distance of about 14,650 lineal feet.

Permission is also hereby granted to lay a further distance, not to exceed a otal of 11,750 lineal feet, on such streets and avenues, or parts thereof, as may e selected by the United States Electric Lighting Company from the following ist, provided that the aggregate length of conduit laid under the provisions of his permit shall not exceed 5 miles, or 26,400 feet, as provided in the District ppropriation act approved March 3, 1891. And the United States Electric ighting Company shall give notice in writing to the Commissioners of the Dis-ict of Columbia of the streets and avenues or parts thereof, thus selected be-re commencing any construction under the terms of this permit.

Eighteenth street west, from Massachusetts avenue to Florida avenue; Sixenth street west, from Massachusetts avenue to Florida avenue; Rhode Island enue, from Fourteenth to Seventh streets; C street west, from Four-and-a-half Second street west: Madison Place, from Pennsylvania avenue to H street, d H street, from Madison Place to Seventeenth street; Eighth street SE., om Pennsylvania avenue to I street; New Hampshire avenue, from Wash-

ington Circle to Dupont Circle; H street north, from Seventh street west to Fifteenth street east; East Capitol street, from First street to Eleventh street; First street east, from East Capitol street to B street south; Rhode Island avenue, from Scott Circle to Fourteenth street west.

It being the express understanding and agreement that this permit is not in any way to relieve the United States Electric Lighting Company from a full and complete compliance with any and all acts of Congress hereafter passed in pursuance or otherwise of the recommendation of the board of three persons authorized by the appropriation act of August 6, 1890, for the District of Columbia, to consider the location, arrangement, and operation of electric wires in said District; and it being further understood and agreed that any and all overhead cables and wires and all poles of the United States Electric Lighting Company along the streets and avenues specified shall be removed at the expense of the said company within the shortest practicable time after the completion and full equipment of the conduits.

All work under this permit shall be in accordance with the requirements of the engineer department of the District of Columbia.

The work to be done at the sole risk and expense of the United States Electric Lighting Company, under the direction and subject to the requirements of this office, to be commenced within sixty days from this date, and completed within one hundred and eighty days thereafter, unless further extended by the Commissioners of the District of Columbia.

No part of the said conduits, or any of them, shall be laid elsewhere than in the carriageway of the streets and avenues upon which they are authorized to be laid, and the said United States Electric Lighting Company shall, before commencing work hereunder, deposit with the collector of taxes of the District of Columbia, in such sums and at such times as the same may, from time to time, during the progress of the work, be demanded by the Commissioners, an amount sufficient to meet the estimated cost of restoring all street surfaces disturbed to good condition

Official copy furnished engineer department, District of Columbia.

By order:

W. TINDALL, *Secretary.*

Accepted:

A. A. THOMAS, *President.*

UNITED STATES ELECTRIC LIGHTING COMPANY,
March 3, 1891.

CHESAPEAKE AND POTOMAC TELEPHONE COMPANY.

LETTER FROM THE COMMISSIONERS OF THE DISTRICT GIVING PERMISSION TO EXTEND THEIR UNDERGROUND SYSTEM.

OFFICE OF THE COMMISSIONERS,
DISTRICT OF COLUMBIA,
Washington, D. C., March 3, 1891.

Ordered, That permission is hereby granted the Chesapeake and Potomac Telephone Company to lay underground conduits for telephone purposes in the following-named streets and avenues in the city of Washington, D. C.:

Beginning at proposed new exchange, west side of Fourteenth street, between H and I streets, running north on Fourteenth to I street with five 8-duct pipes; thence north on Fourteenth street to K street with four 8-duct pipes; thence north on Fourteenth street to M street with one 8-duct pipe; thence northeast on Vermont avenue to Rhode Island avenue with one 6-duct pipe; thence on Rhode Island avenue to Ninth street, and on Ninth street to Boundary; thence on Boundary to Eighth street with one 6-duct pipe, with a branch from Rhode Island avenue into alley in square 364; also branch at intersection of Vermont and Rhode Island avenues into square 241; also branch at Vermont avenue and M street, running east along M street to Ninth street, north on Ninth street to alley in square 400, with one 6-duct pipe. Beginning at Fourteenth and K streets and running west on K street to Fifteenth street with three 8-duct pipes; thence on K street to Seventeenth street with three 6-duct pipes; thence on K street to Nineteenth street with two 8-duct pipes; thence on K to Twenty-ninth street with one 8-duct pipe; thence north on Twenty-ninth to M street and on M to Thirty-first street with one 6-duct pipe; thence north on Thirty-first street to and into alley in square 38.

Branch at Nineteenth and K streets, to run north on Nineteenth to O street with one 8-duct pipe; thence north on Nineteenth to Q street with one 6-duct pipe; thence with branches into squares 93, 111, and 134. Also, branch on Nineteenth street into squares 140 and 117.

Branch beginning at Fifteenth and K streets, running north on Fifteenth to O street with one 8-duct pipe; thence west on O street to and into alley in square 181, with branch from Fifteenth street into square 197.

Beginning at proposed new exchange on Fourteenth, between H and I streets, running south on Fourteenth to G street, with seven 8-duct pipes; thence south on Fourteenth street to Pennsylvania avenue with five 8-duct pipes; thence south on Fourteenth street to D street, east to Thirteenth street, south to C street, east to Twelfth street, with two 8-duct pipes; thence south on Twelfth street to Virginia avenue SW., and on Virginia avenue to Ninth street SW., with one 8-duct pipe; thence south on Ninth to E street; thence east on E street to and into alley in square 412 with one 6-duct pipe.

Branch Fourteenth and G streets NW., running easterly to Tenth street, with two 8-duct pipes; thence on Tenth to F, east on F to and into alley in square 377.

Branch Thirteenth and F streets NW., to and into alley in square 254.

Branch beginning at Fourteenth and Pennsylvania avenue, running east on E to Twelfth street, with three 8-duct pipes; thence east on E street to Tenth street with three 6-duct pipes; thence east on E to Ninth street; thence south on Ninth to D street; thence east on D to Sixth street with two 8-duct pipes.

It being the express understanding and agreement that this permit is not in any way to relieve the Chesapeake and Potomac Telephone Company from a full and complete compliance with any and all acts of Congress hereafter passed in pursuance, or otherwise, of the recommendation of the board of three persons authorized by the appropriation act of August 6, 1890, for the District of Columbia, to consider the location, arrangement, and operation of electric wires in said District; and, it being further understood and agreed that any and all overhead cables and wires, and all poles of the Chesapeake and Potomac Telephone Company, along the streets and avenues specified, shall be removed at the expense of the said company within the shortest practicable time after the completion and full equipment of the conduits.

All work done under this permit shall be in accordance with the requirements of the engineer department of the District of Columbia.

The work to be done at the sole risk and expense of the Chesapeake and Potomac Telephone Company, under the direction and subject to the requirements of this office, to be commenced within sixty days from this date, and completed within one hundred and eighty days thereafter, unless further extended by the Commissioners of the District of Columbia.

No part of the said conduits, or any of them, shall be laid elsewhere than in the carriageways of the streets and avenues herein specified, and the said Chesapeake and Potomac Telephone Company shall, before commencing work hereunder, deposit with the collector of taxes of the District of Columbia, in such sums and at such times as the same may, from time to time, during the progress of the work be demanded by the Commissioners, an amount sufficient to meet the estimated cost of restoring all street surfaces disturbed to good condition.

The aggregate length of all conduits or subways constructed hereunder shall not exceed 5 miles, as prescribed in the District appropriation act approved March 3, 1891.

Accepted for the Chesapeake and Potomac Telephone Company.

SAM'L M. BRYAN,
President.

Official copy furnished engineer department of the District of Columbia.
By order:

W. TINDALL,
Secretary Board of Commissioners.

STREET RAILWAYS.

Abstract of mileage, construction, and equipment of street railways in the District of Columbia, Washington, D. C.

METROPOLITAN RAILWAY.

Mileage, 10.25 miles double track; has 620 horses in service; runs 70 cars; Belgian block and cobble is used between tracks; cars have a capacity of 24 pas-

sengers each; 60-pound grooved rails are used. This company intends substituting electricity instead of horse power in the near future. Are going to use the storage-battery system. Will have their own design of motors; cars 16 feet long by 6 feet 6 inches, as at present; grade, 4 per cent, 1,000 feet long.

WASHINGTON AND GEORGETOWN RAILROAD.

Mileage, 10.50 miles double track; has 750 horses in service; runs 203 cars; granite, asphalt block, and cobble is used between tracks; cars have a seating capacity of 22 passengers each; 80-pound girder rails; size of cars, 16 feet and 22 feet; weight of cars, 5,000. The substitution of cable for horses is now in progress and will be completed during the present year.

GEORGETOWN AND TENNALLYTOWN ELECTRIC ROAD.

Voltage, 500; number of cars running at one time, 10; mileage, 4 miles; double track; weight of motors, 2,000 pounds; maximum grade, 12 per cent, 1,800 feet long; size of cars, 8 by 12 feet; seating capacity of each car, 30; kind of rails, 80-pound girder; kind of motor, No. 30 Thomson-Houston.

CAPITOL, NORTH O STREET AND SOUTH WASHINGTON RAILROAD.

Mileage, 1.6 mile single and 6.5 miles double track; number of horses in service, 225; number of cars in service, 51; seating capacity of each car, 14; kind of roadbed between tracks, granite, asphalt blocks, bluestone, and cobble; kind of rail, side-bearing 10½ pounds per foot; center-bearing 11 pounds per foot; size of cars, 10 feet long; weight of cars, 3,300 pounds.

THE ECKINGTON AND SOLDIERS' HOME ELECTRIC RAILWAY.

Voltage, 500; number of cars running at one time, 15 maximum, 6 minimum; mileage, 5 miles double track; weight of motors, 2,200 pounds; maximum grade, 10 per cent, 650 feet long; size of cars, 8 by 10 feet; seating capacity, 24 for each car; kind of rails, 80-pound grooved; kind of motors, No. 30 Thomson-Houston. On the G street line the Edce system is in use. The cars will be the same size as those used at present.

OFFICIAL STATEMENT OF TAXES PAID BY FRANCHISED CORPORATONS USING THE PUBLIC STREETS IN THE DISTRICT OF COLUMBIA.

OFFICE OF THE ASSESSOR, DISTRICT OF COLUMBIA,
June 10, 1891.

GENTLEMEN: In reply to your verbal request of a few days ago, I inclose herewith a statement marked A, showing the amount of real and personal property assessed to the street railroads, gaslight and electric-lighting companies in the District of Columbia, and the total amount of tax assessed against each.

The tax on the real estate of the various companies is at the rate of $1.50 on each $100 of assessed valuation. The amount of personal tax for the Washington and Georgetown, Metropolitan, Capitol, North O Street and South Washington, and the Columbia Street Railway Companies, the Washington and Georgetown Gaslight Company, and the United States Electric Lighting Company is also at the rate of $1.50 on each $100 of assessed valuation of capital stock in accordance with the provisions of section 11 of the act of Congress approved March 3, 1877.

The Eckington and Soldiers' Home Railroad Company, under the provisions of section 2 of its act of incorporation, approved June 19, 1888, and the Georgetown and Tennallytown Railroad Company, under the provisions of section 1 of its act of incorporation of August 10, 1888, are each required to pay annually to the District 4 per cent of their gross earnings in lieu of personal taxes upon personal property.

The Anacostia and Potomac River Railroad Company, under the provisions of section 7 of the act of August 1, 1888, is required to pay, annually, for the first

ten years after the completion of the work, 2 per cent of its gross earnings, and thereafter 4 per cent of its gross earnings, upon passenger traffic. I have not yet heard from the Georgetown and Tennallytown roads as to the amount of passenger traffic for the last calendar year.

Very respectfully,

MATTHEW TRIMBLE,
Assessor District of Columbia.

The ELECTRICAL COMMISSIONERS,
Washington, D. C.

Statement of real and personal tax assessed to the respective railroad, gas light, and electric lighting companies in the District of Columbia.

Companies.	Real estate.	Personal.	Amount of tax.
Metropolitan Railroad Co	$236,810	$734,148 00	$14,564.37
Washington and Georgetown Railroad Co	382 807	1,361,816.00	26,169.35
Capital, North O Street and South Washington Railroad Co	83,925	249,667.00	5,003.88
Columbia Street Railway Co	27,171	139,551.00	2,500.83
Anacostia and Potomac Railroad Co	5,834	22,222.33	531.96
Eckington and Soldiers' Home Railroad Co	3,460	32,396.27	1,347.75
Georgetown and Tennallytown Railway Co	7,249		
Washington Gas Light Co	1,268,529	1,231,471.00	37,500.00
Georgetown Gas Light Co	50,199	93,801.00	2,160.00
United States Electric Light Co		15,000.00	225.00
Western Union Telegraph Co		23,500.00	352.50
American Rapid Telegraph Co		2,000.00	30,00
Postal Telegraph Co		None.	None.
Chesapeake and Potomac Telephone Co		30,000.00	460.00

POSTAL TELEGRAPH AND CABLE COMPANY.

TESTIMONY OF MR. W. H. ALLEN, REPRESENTING THE POSTAL TELEGRAPH-CABLE COMPANY, TAKEN BEFORE THE ELECTRICAL COMMISSION.

Q. What is the extent of your wires overhead and underground?—A. Two and four-fifths miles underground and three-quarters of a mile overhead within the city limits.

Q. How long have you had your underground system in operation?—A. About six years and a half.

Q. Your system of underground wires is operated with the duplex and quadruplex systems, is it not?—A. Yes, sir.

Q. How many miles of your main circuit do you operate with the duplex and quadruplex system?—A. About 250 miles per circuit direct; a mile a third underground in this city.

Q. Do you find any difficulty since you have had the underground system?—A. We find no difficulty with the present cable, so long as it is perfect and intact; but when the pick of the sturdy negro is driven into the pipe, and through the cable, we find very decided difficulty.

Q. If your overhead wires were cut what would be the result?—A. The result would be exactly the same, but the overhead wires would be vastly easier to repair than the cable underground.

Q. How often during the six years have you had your underground cable interfered with?—A. Four times within a year.

Q. How often during the six years?—A. During the first four years of our experience with an underground system we were occasionally interrupted by various causes. During the last year and a half, in which we have been operating another kind of underground system, taking the place of the first, we have been interrupted no less than four times by a pickax.

Q. How deep are your lines buried?—A. About 18 inches.

Q. What system do you use?—A. We are using at the present time what is known as the Waring cable, placed in an iron pipe.

Q. Is the pipe buried in any insulation?—A. For about half the distance our underground cable is placed in what is known as a cement-lined pipe; the rest is laid in a cast-iron pipe.

Q. Are such pipes laid in cement, or in concrete, or bitumen?—A. A portion of the cement-lined pipe is laid in asphalt—perhaps half of it.

Q. Where did these breaks occur?—A. On T street, where we had the cast-iron pipe.

Q. Was not the pipe imbedded in any concrete?—A. Not this pipe.

Q. You have had no difficulty where it was imbedded in concrete material?—A. No, sir; but that is not strange, for the reason that where the pipe is imbedded in concrete there have been no building operations.

Q. Do you suppose if the men had exercised the same carelessness on a water pipe that he would have burst the water pipe?—A. As a matter of fact, where an excavation had been made on Vermont avenue, or in that vicinity, at an excavation of some 400 or 500 feet for sewer purposes, some forty or fifty pipes, more or less, were uninjured, whereas ours was damaged very materially.

Q. Do you think that because they do not know the nature of your pipe, or the nature of your material, that they treat it in a careless or rough manner?—A. I don't know; I merely state the fact.

Q. How often during the six years have you had breaks in your lines, that is, on overhead lines?—A. During some seasons of the year breaks on city wires are frequent, but in good weather we are rarely troubled.

Q. Does not the interruption to telegraph wires overhead occur more frequently than to those that are underground?—A. The interruption to telegraph wires running through the air is more frequent than to wires buried in the earth.

Q. How many distributing stations have you in the city?—A. About four or five.

Q. They are operated on local circuits?—A. Largely.

Q. What is the relative capacity of sending words per minute on the overhead wires to that of the underground?—A. There is no perceptible difference as we are at present constituted with an underground system.

Q. What is the average number of words you can send over the underground wires per minute?—A. There is no difference between underground and overhead in the matter of Morse telegraphing; but a decided difference would be found in automatic work in favor of overhead construction.

Q. To what extent would your expense be increased if you placed these branch offices in connection with your underground system?—A. What do you mean?

Q. To what extent would it affect the policy of your company if you were required to place them underground in the matter of continuing the branch offices? Would your company continue the same number of branch offices if connected with an underground system as they do now with the overhead lines?—A. It would depend very much upon what it would cost to connect with those branch offices underground.

Q. What was the reason of your selecting this particular route as marked on the map?—A. It offered the readiest connection with our pole lines beyond the city limits.

Q. How do you draw in your cables?—A. By means of a rope or wire.

Q. What is the distance between your hand-holes?—A. The distance varies from 200 to 350 feet.

Q. How are you affected by the electric-light wires?—A. The underground wires are not affected by the electric-light wires, not running the same route. Our overhead wires have been more or less troubled in times past where they occupied the same pole.

Q. Then you think the underground wires are an improvement in that respect?—A. There is no question about that.

Q. Do you prefer separate conduits and their ownership by each company, to the public system of ducts or subways based on a rental tax for their use; and if so, state your reasons?—A. That is a question involving considerable thought and consideration, and which I don't feel justified in answering, being more properly a question to be brought before the executive officers of our company.

Q. Is there any difference in the operation of the multiplex system?—A. Whether overhead or underground? No perceivable difference for duplex or quadruplex system, but for other multiplex systems I think overhead wires would be necessary.

Q. The only difficulty you have had has been the abuse of your cables by persons negligently cutting up the streets, and if a rule was enforced by the city in that respect you would have no trouble?—A. If the rule was carried into effect, we would have no trouble at all; being neglected, the conditions are very decidedly changed.

Q. How long since you have had an accident to your cable?—A. About three or four months, I think.

Q. You have had no trouble in three months?—A. No, sir.

Q. How long have your cables been there, and do you find any electrical deterioration of them irrespective of the mechanical injury?—A. About a year and a half, and aside from the picks we have had no trouble in the slightest degree.

Q. You have the same kind of cable you had six years ago, have you not?—A. No, sir.

Q. What kind of cable did you use at first?—A. Our first underground system was known as the Hurlbut system.

Q. Of what did this underground system known as the Hurlbut system consist?—A. It consisted of sixteen wires buried in a composition mainly of asphalt. We worked this system with occasional trouble, or rather, we worked two to four wires of the system. We never worked beyond that. For a matter of about four years it worked fairly well, but finally, after about four years' use, it gave out altogether and became entirely useless. This system cost the company, as I am informed, some $15,000 for the mile and a half over which it extended.

Q. What multiplex system do you use?—A. The ordinary duplex and quadruplex systems.

Q. How do you connect your branch offices?—A. Our branch offices are all connected with overhead wires.

Q. They are in different portions of the city, are they not?—A. Yes, sir.

Q. How do you reach your branch offices from the main office?—A. Almost entirely over the roofs of our neighbors.

Q. Your lines are operated by battery, of course?—A. Yes, sir.

Q. Could your company furnish us with a statement of the cost of the cable as now constructed?—A. Most certainly. I don't think there would be the slightest objection to it.

Q. About what is the longest circuit that you run at times here?—A. From here to New York, from here to Pittsburg, etc., without repeaters, and occasionally as far as to Augusta, Ga.

OTHER TESTIMONY.

LETTER FROM THE SUPERINTENDENT OF THE POSTAL TELEGRAPH OF GREAT BRITAIN.

LONDON, ENGLAND, *April 20, 1891.*

ELECTRICAL COMMISSIONERS,
Washington, D. C.:

In reply to your letter of April 4, I have to say that 1 to 5 miles of main circuit placed underground on entering or passing through a city would have no practical effect whatever in operating a triple or quadruplex circuit.

Nearly all our circuits entering London have from 5 to 10 miles under ground.

We invariably use 3-inch cast-iron pipes into which we draw cables of gutta-percha covered wire.

I am, yours faithfully,

W. H. PREECE.

Data of Various Kinds Relating to the Different Cities of the World.

GREAT BRITAIN.

DIGEST OF THE LAW OF ELECTRIC LIGHTING IN GREAT BRITAIN.

[By A. C. Curtis Hayward, B. A., Solicitor, Associate Institute of Electrical Engineers.]

Electric lighting is governed by two acts of Parliament known as the electric lighting acts, 1882 and 1888, which apply to the whole United Kingdom. The former incorporates portions of the gasworks clauses acts, 1847 and 1871, the lands clauses acts, 1845, 1860, and 1869, and the telegraph act, 1878.

Three other important documents must be referred to, all emanating from the Board of Trade. These are (1) the rules made under (1882) No. 5,* with respect to applications for licenses and provisional orders, etc.; (2) the regulations made under (1884) No. 4, for the protection of public safety and of the lines and works of the postmaster-general, and of other electric lines and works; and (3) the model form of provisional order for the metropolitan area.

This model order fills in details to the outline sketched by the acts, and as the Board of Trade require its provisions to be inserted in all metropolitan orders and licenses, and has applied similar provisions with only slight alterations in provincial cases, it must be treated for practical purposes as a part of the general law of electric lighting. It seems, however, that no machinery being provided by the acts for recovering penalties, which the Board of Trade are empowered by (1882) No. 6 (f) to impose, for securing performance of the undertakers' obligations, the penalties prescribed by the model order can not be enforced in the case of licenses, because a license does not, like a provisional order, receive the direct sanction of Parliament. These provisions of the model order must, therefore, so far as licenses are concerned, be considered to be in abeyance of the present, pending future legislation, which will doubtless be speedily enacted. It is also open to question whether some other provisions of the model order do not fall within the same category.

In cases where the local authorities are themselves the undertakers a few alterations in the form will obviously be necessary. (*See* Part 2, No. 5, local authority.)

The law will here be dealt with in two parts:

1. Preliminary. Treating of the manner in which persons desirous of supplying electricity must set to work.
2. Treating of their rights and obligations after obtaining parliamentary powers.

PART 1.—PRELIMINARIES TO UNDERTAKING THE SUPPLY OF ELECTRICITY.

SUPPLY OUTSIDE THE ACTS.

Before proceeding to deal with those who supply electricity under Parliamentary powers, called by the acts "undertakers," a passing mention should be made of the position of persons who may supply electricity without obtaining such powers.

Previously to the electric-lighting acts such persons might place their conductors wherever they could get leave to do so, though for breaking up streets, etc., even with consent of the local authorities, they were liable to indictment for causing a nuisance. It has been held, however, that local authorities have no more power of interfering with overhead wires crossing the streets than is possessed by ordinary members of the public (see Wandsworth Board of Works

*The electric lighting acts of 1882 and 1888 are respectively indicated thus: (1882) and (1888); a figure immediately following indicates the section of the act referred to.

v. United Telephone Company, Limited, 13 Q. B. D., 904). On the other hand, it must be borne in mind that private individuals could always prevent wires passing over their property, even though not attached to anything upon it.

The act of 1882 had no effect upon this state of things, but (1888) No. 4 has rendered all electric lines or other work laid down or erected in, over, along, across, or under any street, for the purpose of supplying electricity, liable to regulations of the Board of Trade for the protection of public safety and of telegraph works. The regulations issued by the Board of Trade under this section provide that the height of an aërial conductor must not be less than 20 feet, or 30 feet where crossing a street, nor be within 6 feet of any building, except when brought in for purposes of supply, and the angle of crossing a street must not be less than 60°. The spans must not exceed 200 feet, or 150 feet if the directions is curved or dips. They prescribe the factors of safety for wires, supports, etc., efficient earth connections for metal supports and coverings, lightning conductors and protectors; precautions against contact with other wires, the maximum working current, and also specify the insulation and mode of suspension in case of high pressure. For alternating currents the two conductors must be parallel and not more than 18 inches apart. A plan of all aërial conductors is to be lodged with the postmaster-general, and all supports are to bear a mark indicating their ownership. All conductors and supports are to be efficiently supervised and maintained by the owners, and removed when use has ceased. (See also Part 2, No, 5, postmaster-general.)

These regulations do not apply and the section does not extend to telegraph wires, nor to wires laid under Parliamentiary powers, nor do they effect conductors entirely inclosed within buildings, or used for supplying electricity from one part of premises to another in the same occupation.

PARLIAMENTARY POWERS.

Three methods are provided by the acts for obtaining Parliamentary powers to supply electricity within a defined area, viz., special act, license, and provisional Order.

Special act.—This method calls for but little notice. Only one such act has hitherto been passed, and that under exceptional circumstances. The Board of Trade are unfavorable to any special act being applied for where parties can apply for a provisional order; and in the face of their opposition it is unlikely that an application under this head will be successful.

But however this may be, it is improbable that Parliament will grant more favorable terms by special act than may be obtained by provisional order, or will relax any of the obligations or restrictions laid down in the model order.

License.—This must also be regarded as a method of secondary importance, especially as the Board of Trade have announced that, except of applications by local authorities, licenses will not be granted for large areas, such as the whole of a provincial town, or a London parish.

The term can not exceed seven years, although it may be renewed upon the same conditions as are applicable to an original grant.

The consent of the local authority must be obtained in the manner specified under the head of procedure, and if this consent is withheld a license can not be even applied for.

A license can not be granted until three months after notice has been advertised, and the formalities completed, as stated under the head of Procedure.

The proceedings are regulated by (1882) No. 3, and the Board of Trade rules above referred to.

The compulsory powers of purchase by local authorities do not apply to undertakings authorized by license.

The advantages of proceeding by license are, that it can be more expeditiously and cheaply obtained, and is not hampered by any requirements as to notices being given before fixed days in the year. It comes into operation without the necessity of being confirmed by Parliament, and may sometimes be obtained to save time while an application for a provisional order is pending. A license may also be useful when undertakers, who already hold a provisional order, desire to extend their system into a small area not included within their existing powers. On the other hand is the disadvantage above referred to, that certain provisions which may be valid in a provisional order, might be *ultra vires* in a license.

Provisional order.—This is by far the most important method of proceeding. The grant is made by the Board of Trade, but must be confirmed by Parliament, where the bill may be opposed, as well as before the Board of Trade.

The proceedings are regulated by (1882) No. 4, and the aforesaid rules.

Notice must be served on every local authority within the proposed area of supply before July 1, in the year in which the application is to be made.

Advertisements, as described under the head of procedure, must be published in the month of October or November following, and copies of the advertisement and a map of the proposed area deposited at the Board of Trade and at the offices of every clerk of the peace and local authority within the area, on or before November 30.

The memorial applying for the order, and documents mentioned under the head of procedure as required to accompany it, must be lodged at the Board of Trade on or before December 21.

The applicants must be prepared to prove compliance with the act and rules by January 25 following, and the proof must be completed by February 25.

The confirmation bill may be passed at any time before the end of the current session of Parliament.

The order dates from the day when the confirming act is passed.

The other preliminaries which are common to licenses and provisional orders are described under the head of Procedure.

The consent of the local authority is rendered necessary to the grant by (1888) No. 1, but the Board of Trade have power to dispense with this consent on sufficient grounds to be stated in a special report. This power has been exercised in several cases, and provisional orders confirmed by Parliament, notwithstanding opposition by the local authority.

The liability to compulsory purchase of the undertaking by the local authority at the end of forty-two years is one of the incidents of a provisional order. The terms of purchase, unless varied by agreement between the parties with the consent of the Board of Trade under (1888) No. 3, are laid down by (1888) No. 2, which stands as follows:

"Where any undertakers are authorized by a provisional order or special act to supply electricity within any area, any local authority within whose jurisdiction such area or any part thereof is situated, may within six months after the expiration of a period of forty-two years or such shorter period* as is specified in that behalf in the provisional order or in the special act, from the date of the passing of the act confirming such provisional order, or of such special act, and within six months after the expiration of every subsequent period of ten years, or such shorter period as is specified in that behalf in the provisional order or in the special act, by notice in writing require such undertakers to sell, and thereupon such undertakers shall sell to them their undertaking, or so much of the same as is within such jurisdiction, upon terms of paying the then value of all lands, buildings, works, materials, and plant of such undertakers, suitable to and used by them for the purposes of their undertaking within such jurisdiction, such value to be in case of difference determined by arbitration: *Provided*, That the value of such lands, buildings, works, materials, and plant shall be deemed to be their fair market value at the time of the purchase, due regard being had to the nature and then condition of such buildings, works, materials, and plant, and to the state of repair thereof, and the circumstance that they are in such a position as to be ready for immediate working, and to the suitability of the same to the purposes of the undertaking, and where a part only of the undertaking is purchased, to any loss occasioned by severance; but without any addition in respect of compulsory purchase, or of good will or of any profits which may or might have been, or be made from the undertaking, or of any similar considerations. The Board of Trade may determine any other questions which may arise in relation to such purchase, and may fix the date from which such purchase is to take effect, and from and after the date so fixed, or such other date as may be agreed upon between the parties, all lands, buildings, works, materials, and plant so purchased as aforesaid, shall vest in the local authority which has made the purchase, freed from any debts, mortgages† or similar obligations of such undertakers or attaching to the undertaking, and the powers of such undertakers in relation to the supply of electricity under this act, or such provisional order or special act as aforesaid within such area or part thereof as aforesaid, shall absolutely cease and determine, and shall vest in the local authority aforesaid."

*In the Liverpool order, 1889, the term is reduced to twenty-one years, and subsequent periods of seven years.

†Clause 75 of the model order provides that mortgages shall not be a charge on the undertaking in the event of sale, but shall comprise the purchase money, and every mortgage shall be indorsed with a notice to that effect.

printed copies of the draft, license, or order can be obtained at a price not
ling 1s. It must also inform the public that objections should be lodged by
addressed to the Board of Trade, in case of a provisional order, before Feb-
1, and in case of a license, within two months from the first advertisement.
e of this latter fact must also be printed at the end of the draft; see rule
he advertisement must be inserted once, at least, in each of two successive
in the same newspaper, circulating in the proposed area, or such other
aper as the Board of Trade may direct, and once in the London, Edinburg,
blin Gazette, according as the area of supply is in England, Ireland, or
nd.

consent of any local authority to an application for a license, or the grant
rovisional order, must be signified by a resolution passed at a special meet-
such local authority held after a month's notice, of the purposes of such
ng, and the fact must be certified in the form required by rule 8.

lications must be by memorial addressed to the Board of Trade, accompa-
y six printed copies or the draft order or license applied for (rule 3).

draft must contain, besides the matters required to be stated in the ad-
ement, a statement of the purposes for which a supply is to be given; the
ions and obligations thereof, including price, nature, and amount of sup-
rovisions for securing the safety of the consumers and of the public, and for
ing performance by the undertakers of their duties in relation to the sup-
nd for the revocation of the license or order, where the undertakers fail to
m such duties (rule 4).

ompanying the memorial there must be deposited with the Board of Trade
5 and 6)—(1) A map of the proposed area (copies of this must also be
l with the clerk of the peace and the local authority for each district in-
l). (2) A list of such local authorities. (3) A list of streets not repairable
al authorities, and of railways and tramways, canals and navigable rivers
d (if any). (4) A statement of the capital to be expended, and the mode of
ling it. (5) If the applicants are a company, a copy of their memorandum
rticles of association. (6) A fee of $50 to cover ordinary expenses of the
of Trade. Further expenses, if incurred in consequence of inquiries or
rise, must be paid by the applicants in addition to the above.

en the undertakers under any license, order, or special act desire the con-
f the Board of Trade, under (1882) No. 13, to enable them to break up any
not repairable by a local authority, or any railway or tramway which they
t empowered to break up under such license, order, or act, application
be made by memorial (see rule 7), giving full particulars of what is re-
l. Notice must be given to all parties interested therein, and no consent
e given until these have had an opportunity of stating objections thereto.
manner of serving notices is prescribed by rule 9.

ections to the grant and copies of any clauses or amendments desired must

PART 2.—POSITION OF UNDERTAKERS AND RIGHTS OF THE PUBLIC AFTER PARLIAMENTARY POWERS HAVE BEEN GRANTED.

It is provided by (1882) No. 3, subsection 8, that a license may make certain regulations, and section 4 states that a provisional order shall be subject to like provisions. The same provisions are, however, also authorized by section 6, which is much more comprehensive, and stands as follows:

"The undertakers shall be subject to such regulations and conditions as may be inserted in any license, order, or special act affecting their undertaking with regard to the following matters:

"(*a*) The limits within which, and the conditions under which, a supply of electricity is to be compulsory or permissive;

"(*b*) The securing a regular and efficient supply of electricity;

"(*c*) The securing the safety of the public from personal injury, or from fire or otherwise;

"(*d*) The limitations of the prices to be charged in respect of the supply of electricity;

"(*e*) The authorizing inspection and inquiry from time to time by the Board of Trade and the local authority;

"(*f*) The enforcement of the due performance of the duties of the undertakers in relation to the supply of electricity by the imposition of penalties or otherwise, and the revocation of the license or special act where the undertakers have, in the opinion of the Board of Trade, practically failed to carry the powers granted to them into effect within a reasonable time or discontinued the exercise of such powers; and

"(*g*) Generally with regard to any other matters in connection with the undertakings.

"Provided always that the Board of Trade may from time to time make such regulations as they may think expedient for securing the safety of the public from personal injury or from fire or otherwise, and may from time to time amend or repeal any regulations which may be contained in any such license, order, or special act in relation thereto; and any regulations so made or amended by the Board of Trade shall, from and after the date thereof, have the like effect in every respect as though they had been originally inserted in the license, order, or special act authorizing the undertaking, and every regulation so repealed shall, from and after the date thereof, be repealed accordingly; but such repeal shall not affect any liability or penalty incurred in respect thereof prior to the date of such repeal or any proceeding or remedy which might have been had in relation thereto.

"Any local authority within any part of whose district electricity is authorized to be supplied under any license, order, or special act may, in addition to any regulations which may be made under the preceding provisions of this section for securing the safety of the public, from time to time make, rescind, alter, or repeal by-laws for further securing such safety; and there may be annexed to any breach of such by-laws such penalties, to be recovered in a summary manner, as they may think necessary; provided always that no such by-laws shall have any force or effect unless and until they have been confirmed by the Board of Trade and published in such manner as the Board of Trade may direct."

It is by virtue of these sections that the terms laid down in the model order are imposed by the Board of Trade, which will now be considered, together with other sections of the acts under the following titles:

(1) General obligations of undertakers and miscellaneous provisions.
(2) Rights of undertakers.
(3) Regulations as to laying down mains, etc., and testing same.
(4) Rights of the public to obtain supply, and their obligations in connection therewith.
(5) Position of local authorities, county councils, and the postmaster-general.

1. GENERAL OBLIGATIONS OF UNDERTAKERS AND MISCELLANEOUS PROVISIONS.

A.—*Accounts, maps, and other documents to be kept, published, or deposited by undertakers.*

Printed copies of their license or provisional order must be deposited for public inspection at the Board of Trade, and at the office of every clerk of the peace and local authority within the area of supply, and be supplied to all persons applying for the same (rule 14).

Annual accounts must be published in such form and manner as the Board of Trade may approve, by March 25, in each year, made up to the previous December 31, and copies be supplied to all applicants at 1*s.* each. Penalty for default, 40*s.* a day (1882) No. 9. Separate accounts of capital employed must also be kept under each provisional order held by the undertakers. These must be distinct from accounts of any manufacturing or other business (clause 8).*

A map, on a scale not less than 1 inch to 88 feet, showing the position of mains, service lines, and other underground works and distributing boxes, must be made and corrected annually by the undertakers, and a copy with date of correction kept at their principal office. Copies must also, within one month of correction, be served on the Board of Trade, postmaster-general, London county council, and local authority. Penalty for default, £20, and £2 for each day after the first (clause 25–27.)

Forms of requisition to lay mains referred to in clause 22 (see 4) must be kept and supplied to applicants gratis.

A description of lands (if any) proposed to be acquired by the undertakers must be deposited at, and contract for acquiring the same produced to, the Board of Trade. No license or provisional order is to have any effect until this has been done (rule 13).

B.—*Security to be given.*

The undertakers (if not a local authority) must within six months,† and before exercising any powers, satisfy the Board of Trade that they are in a position fully and effectually to discharge their obligations, and they must make a cash deposit or give security ‡ in respect of their whole authorized area, or separately in respect of the district of each local authority included therein. For failure in this respect the Board of Trade may revoke the order as to the whole or part of the area. The security will be released in equal moieties on the certificate of the Board of Trade inspector that an equivalent has been expended by the undertakers, or that distributing mains have been laid in all the scheduled streets, or otherwise as the board may approve (clause 7).

In case of the undertakers' powers being revoked, claims for compensation in respect of damage consequent upon works or other exercise of their powers, or for the cost of removal of their works, are to be a first charge on the money deposited or secured, which is to be applied ratably in satisfaction of such claims as may be determined by a Board of Trade arbitrator (clause 67, *f*).

C.—*Amalgamation.*

Undertakers are forbidden, under penalty of revocation, to purchase or acquire the undertaking of, or associate themselves with, any other company or person supplying electrical energy within the county of London, without the consent of the Board of Trade, after one month's notice to the local authority. In the orders granted in 1889 to metropolitan companies the sanction of Parliament is substituted for that of the Board of Trade, but the orders granted for the provinces do not contain any restrictions on this subject.

D.—*Liability for nuisance, injury, etc.*

No statutory powers are given to undertakers which will exempt them to the extent of railway companies from injunction or indictment for nuisance.

The existing state of the law is emphasized, but not altered in any way by clauses 74 and 78, the one providing that "The undertakers shall be answerable for all accidents, damages, and injuries happening through the act or default of the undertakers or of any person in their employment by reason or in consequence of any of the undertakers' works, and shall save harmless all authorities, bodies, and persons by whom any street is repairable, and all other authorities, their officers and servants, from all damages and costs in respect of such accidents, damages, and injuries;" and the other that "Nothing in the

*This and similar references indicate the clauses of the model order.

†When anything has to be done within a fixed period, unless otherwise stated, the period is understood to date from the commencement of the order, which is defined by clause 3 to be the day on which the act of confirmation is passed.

‡In the case of metropolitan companies the Board of Trade have required the amount to be £1,000 in respect of each local authority's district included in the area of supply. Thus the amount required from the London Electric Supply Corporation was £13,000, since their area extends into thirteen of such districts.

order shall exonerate the undertakers from any indictment, action, or other pr ceedings for nuisance in the event of any nuisance being caused by them." (Se also the proviso reserving the rights of telephone companies, No. 3, C.)

The first of these clauses might appear to extend the liability of undertaker to accidents where they have been guilty of no negligence or default. This, how ever, has been held not to be the case in the interpretation of similar word under the tramways act, 1870, section 75. (See Brocklehurst *v.* Manchester, etc. Tramways Company, 17 Q. B. D., 118).

E.—*Future grants and acts of Parliament.*

No monopoly is granted to undertakers, and (1888) No. 1 expressly declare that a grant by license or provisional order shall not restrict subsequent grant for the same area. It is also declared by clause 79 that undertakers are not ex empted from the provisions nor deprived of the benefit of any future general act

F.—*Revocation.*

The power to revoke a license, provisional order, or special act is given to th Board of Trade by (1882) No. 6 (*f*) (quoted above) in the events therein mentioned

The model order prescribes seven occasions for the exercise of this power namely, if the undertakers—

(1) Amalgamate with another undertaking without leave (clause 4).

(2) Supply outside their own area (clause 6).*

(3) Fail to find security or make deposits as required by clause 7.†

(4) Fail to comply with the provisions as to compulsory works (clause 21).

(5) Fail to execute works or supply energy as required, and are, owing to in solvency, unable fully and efficiently to discharge the duties imposed on them. A representation to this effect, and application for revocation, must be made by th local authority (clause 64).

(6) Satisfy the Board of Trade that they are unable to carry on the undertakin with profit, and that it ought to be abandoned. In this case the undertakers mus themselves apply for revocation (clause 65).

(7) In addition to the above, the Board of Trade may revoke on such terms a they may think just, at any time, with consent of the undertakers and local au thority (clause 66).

In all these cases, except the first, second, and last, the revocation may be par tial, if the undertakers so desire, and as regards the sixth case, if the local autho ity also consent. In the fourth case it is also provided that after hearing repre sentations from the local authority, the board may suffer the order to remain i force, subject to such conditions as they may impose, and which are thereupon t become of like force as though they had been contained in the original orde

On revocation of an order, the following provisions take effect as regards th whole area of supply, or such part as the revocation applies to (see clause 67).

Notice of such revocation is to be served by the Board of Trade upon the under takers and local authority, fixing the date from which all powers and liabilitie of the undertakers for supply under the order cease. Within one month afte service, the local authority may, by notice, require the undertakers to sell s much of their undertaking as is comprised in the revoked area, upon the term of the compulsory purchase section (1888) No. 2.

If the local authority do not buy, the Board of Trade may allow the undertakers to sell and transfer the undertaking to any one else, but not on lower terms than the statute provides, without the consent of the local authority.

When a sale is effected and transfer directed by the Board of Trade, the un dertaking, or the part thereof purchased, vests in the purchasers freed of all debts, mortgages, or similar obligations, and the order is to remain in force in favor of the purchasers. Mortgages would be a charge on the purchase money under clause 75.

If no purchase is effected, the local authority or owners of streets in which works of the undertakers have been placed may, with reasonable care, remove such works, and the undertakers must pay the costs of removal and of reinstating the streets, the amount to be settled, if necessary, by arbitration. After a month's default in payment, such works may be sold, and the proceeds, after defraying expenses, paid to the undertakers.

* No prohibition on this subject is contained in the provincial orders grated in 1889.

† In the Liverpool and Birmingham orders, 1889, failure to keep certain capital appropriated t the undertaking, and distinct accounts thereof, is made an additional ground of revocation.

G.—*Approvals, extensions of time, consents, and orders of the Board of Trade.*

These are to be signified in writing, signed by one of its secretaries or assistant secretaries (clause 69). Costs incident thereto, including the cost of tests (if any) in connection therewith are to be paid by the applicants. On approval of any plan, pattern, or specification, copies may be required to be deposited at the Board of Trade, and such approval may from time to time be revoked or modified (clause 70). Notice of any approval or any extension of time for performance of undertakers' duties, or of an order of revocation made on application of the local authority, must be advertised once at least for two successive weeks in the same local newspaper by the applicants (clause 71). Notice of an application for extension of time by undertakers must be given to the local authority, who are to have an opportunity of making objections thereto (clause 72).

H.—*Notices, etc.*

Are to be served by or upon the undertakers in the manner prescribed by clause 63, and notices given by a local authority will be sufficiently authenticated by the signature of their clerk or surveyor (clause 62).

I.—*Arbitration.*

Unless in any case it is otherwise expressly provided, all matters directed under the general acts, or any license, order, or special act, to be determined by arbitration, are to be determined by an engineer or other fit person nominated on the application of either party by the Board of Trade, under the Board of Trade arbitrations, etc., act, 1874 (1882, No. 28).

J.—*Recovery of penalties.*

Where not otherwise provided for, these may be recovered in a summary manner before a court of summary jurisdiction.

The obligations of undertakers as to compulsory supply are dealt with in No. 4.

2. RIGHTS OF UNDERTAKERS.

The general enabling provisions of the electric-lighting acts are contained in (1882) No. 10, which is as follows: "The undertakers may, subject to and in accordance with the provisions and restrictions of this act, and of any rules made by the Board of Trade in pursuance of this act, and of any license, order, or special act authorizing or affecting their undertaking, and for the purpose of supplying electricity, acquire such lands by agreement, construct such works, acquire such licenses for the use of any patented or protected processes, inventions, machinery, apparatus, methods, materials, or other things, enter into such contracts, and generally do all such acts and things as may be necessary and incidental to such supply."

A.—*Powers of acquiring land.*

This is by agreement only, the compulsory provisions of the lands clauses acts being expressly excluded by (1882) No. 12.

B.—*Power to supply electricity.*

This power which (1882) Nos. 3 and 4 enacts may be given by license or provisional order, is granted by clause 9 of the model order within the area which is defined by the first schedule.

The undertakers are forbidden under clause 6, on pain of revocation, to erect or lay down any lines or works outside their area without the authority of Parliament or a license. An exception is made to enable the undertakers to carry out binding contracts existing on May 29, 1889, for a period of two years.* All lines and works must be removed within six months afterwards, under penalty of £20 for each offense, and a court of summary jurisdiction may order their removal if this is done by the undertakers.

*This has been further curtailed in the London orders, granted in 1889 to September 29, 1890, or till such earlier date as other undertakers duly authorized may be in a position to take up the supply. No restrictions on this subject have been inserted in the provincial orders.

C.—*Protection of undertakers' property from injury or seizure.*

Maliciously cutting or injuring any electric line or work with intent to cut off supply is made felony by (1882) No. 22, and punishable with five years' penal servitude, or two years' imprisonment.

Maliciously or fraudulently abstracting, or causing to be wasted or diverted, consuming, or using electricity is declared by (1882) No. 23 to be larceny, and punishable accordingly. Fraudulently injuring a meter, or where supply is not charged by meter, using any lamp either larger or for a longer time than contracted for, or supplying any other person with any part of the electricity supplied by undertakers, involves under No. 18 of the gas-works clauses act, 1847, a forfeit to the undertakers of £5 and 40*s.* a day for continuance. Damaging any line, post, lamp, or other work of the undertakers, or willfully extinguishing public lamps or wasting electricity, involves a forfeit to the undertakers of £5, in addition to the amount of damage under No. 19 of the same act. And under No. 20, anyone carelessly or accidentally breaking, throwing down, or damaging any such line, pillar, or lamp must pay damages not exceeding £5.

In addition to the above penalty and damages, undertakers are empowered, under No. 38 of the gas-works clauses act, 1871, in the case of anyone willfully or fraudulently, or by culpable negligence, injuring any line, meter, or fittings of the undertakers, or tampering with a meter, or fraudulently abstracting or consuming or using electricity to cut off the supply until default is made good. The existence of artificial means of committing any of the above offenses is also made evidence of fraudulent intent. (As to improper use by customers, see also No. 4 B.)

Undertakers' property is protected from distress, execution, or bankruptcy proceedings against any person in whose possession it may be by (1882) No. 25.

D.—*Letting apparatus for hire.*

Undertakers are specially authorized by clause 61 to let for hire meters and any fittings thereto, and any other apparatus required for their undertaking, for such remuneration, and on such terms as to repairs, security for the safety and return thereof, as may be agreed between the hirer and the undertakers, or, in case of difference, decided by the Board of Trade, and such remuneration may be recoverable summarily as a civil debt.

E.—*Powers for securing and recovering payments for supply.*

(See No. 4, G and H.)

F.—*Power to break up streets.*

This is not expressly given by the acts, but is imported from the gas-works clauses act, 1847, which is incorporated by (1882) No. 12.

Undertakers are forbidden by (1882) No. 13 to break up private streets, railways, or tramways, without the consent of the Board of Trade. Clause 10 of the model order gives this power as regards streets, etc., specified in a schedule. The same clause also authorizes distributing boxes to be placed in any street which, except so far as the Board of Trade shall otherwise direct, are to be for the sole use and under the sole control of the undertakers. The London orders granted in 1889 add that no box is to be placed above ground without the consent of the local authority, that the covers must be constructed and maintained so as not to be a source of danger, and must not be removed, except at stated hours prescribed by the London county council, under a penalty of £5, unless in case of emergency.

The following are the regulations and restrictions under which these powers may be exercised:

3. REGULATIONS AS TO LAYING MAINS, ETC., AND TESTING SAME.

The sections of the gas-works clauses act, 1847, which apply to this subject are Nos. 6 to 12. Some of these are practically superseded by the more elaborate provisions of the model order on the same subject, but sections 10 and 11 should be noticed, which compel undertakers, under penalty of £5 a day for default, to reinstate ground broken up, convey away all rubbish, fence the works

while in operation, and light them at night, also to keep the road or pavement in repair for three months after breaking up, and for twelve months as regards subsidence. Penalties for want of due diligence or care in such matters are also recoverable under section 160 of the public health act, 1875, incorporating sections 81 to 83 of the town improvement clauses act, 1847.

(1882) No. 17 also provides that the undertakers in exercising their powers are to cause as little detriment and inconvenience as possible, and make compensation for damage done, to be settled by arbitration.

A.—*Requirements before breaking up streets, etc.*

Except in the case of repairs, renewals, or amendments of existing works, the undertakers must, before proceeding, give a month's notice to the body or person liable to repair the street or bridge, or the owner of the railway, tramway, or canal to be disturbed, also to the postmaster-general. The notice must describe the proposed works with a plan, and so far as the London county council, local authority, or postmaster-general are affected, the month of August is not to count in the month's notice. The undertakers may execute the works, if no objection is served upon them for three weeks after notice; but in case of objections by any of the three last-mentioned authorities. the work may only be done on conditions approved by the Board of Trade, or, in case of objection by other parties, on terms to be settled by arbitration (clauses 12 and 13). The repairing authority or owners may give notice that they will execute the required works for and at the expense of the undertakers, in which the case the undertakers must not do them, unless the party so giving notice neglect to do so for twenty-four hours after a time specified by a further requisition to be served by the undertakers not more than forty-eight or less than twenty-four hours before the time so specified. Breach of any of these regulations involves a penalty on the undertakers of £10, and £5 for each day's default after the first; but they will be excused if the case is one of emergency, and they have complied with the requirements so far as was reasonable under the circumstances (clause 14).

N. B.—The gas works clauses act, 1847, No. 8, only requires three clear days' notice before breaking up a street.

B.—*Mutual facilities to undertakers and the owners of other pipes, wires, etc.*

These are granted by (1882) No. 15, "subject to the provisions of this act. and of the license, order, or special act, and to any by-laws made under this act."

Special regulations are accordingly laid down in the model order to be observed by undertakers and the owners of pipes, wires, etc., under any street, as regards interference with each other's works. Clause 15 mak s similar provisions to those described under (A), with respect to notices to be given to the parties whose property is to be interfered with, the right of the latter to do the work themselves, arbitration, and penalties for breach. The main sewers of the London county council are excluded from the scope of this clause.

These mutual rights are extended by clause 16 to the case of undertakers requiring to dig, for laying new works other than service lines near to any sewer, drain, water course, defense, or work under the jurisdiction of the London county council or local authority, or any pipe of any gas or water company; or *vice versa*. Notice, not more than forty-eight or less than twenty-four hours, must be given to the parties affected, who may superintend the work and make requirements for protection of their property. Also compensation must be paid for any loss or damage entailed. The penalties for breach are the same as in the preceding clauses, but are not to be enforced if the default arose through ingnorance (not due to negligence) as to the position of the works affected.

The corresponding clause in London orders granted in 1889 contains further provisions under this heading, extending the notice of fourteen days, requiring works to be supported in case of being undermined, and permitting owners to execute themselves, and at their own risk, the works referred to, upon receiving reasonable payment, except in cases where the London county council have given notice that they will execute them; also requiring forty-eight hours' notice by undertakers or a gas company before connecting a service line or pipe to any house supplied by the other, in which case the same provisions as above are to apply. It also requires lines to be sufficiently insulated wherever liable to touch gas pipes, and forbids gas pipes to be used for completing any electric circuit.

C.—*Protection of telephone companies, etc., and owners of docks, canals, etc.*

Before laying or commencing to use any line in a manner which may injuriously affect telegraphic or telephonic communication through wires lawfully laid, seven days' notice must be given specifying the course, nature, and gauge of the said line, the amount and nature of the current, and what earth returns (if any) will be used. The undertakers must conform to any reasonable requirements, thereupon made by the owners of such wires, and any differences between the latter and the undertakers as to the reasonableness of such requirements are to be settled by arbitration. These provisions do not apply to repairs or renewals, provided the amount and the nature of the current are not altered. The penalties for breach are £5 and 40*s.* for every day's default after the first, with the same exception as in the last clause in case of ignorance (clause 17).

Further protection is also given by clause 9, which forbids any part of the circuit being connected to earth unless approved by the Board of Trade, with the concurrence of the postmaster-general. The corresponding clause* in the orders granted in 1889 also requires that undertakers shall construct their mains and other works of all descriptions, and work their undertaking in all respects with due regard to other electric circuits, from time to time used or intended to be used for telegraphic, telephonic, or electric signaling, and shall use every reasonable means to prevent injurious affection of such circuits, or the currents therein, by induction or otherwise, and shall be bound to make any alterations or additions to their system as may be directed by an arbitrator. A proviso is added that nothing therein is to deprive the owners of such circuits of any existing rights to proceed against the undertakers by indictment, action, or otherwise.

Undertakers must, at the request of owners of canals, docks, or basins, on having reasonable facilities afforded for placing their works round the same, or any land about to be used for such purposes, place or remove the said works accordingly. Disputes on the subject are to be settled by arbitration (1882, No. 16).

D.—*Overhead wires.*

These may not be erected along, over, or across any street without the consent of the local authority, who may remove them if the undertakers fail to do so after notice, and charge the latter with the expense. The model order also makes it an offense to erect such wires without the consent of the London county council, under a penalty of £10, and £5 for each day's continuance after the first. An exception is made in favor of existing wires, which must, however, be removed in two years, otherwise the local authority or London county council may remove or sell then (clause 11). (See also part 1, "Supply outside the acts.")

E.—*Precautions for public safety.*

The act of 1882, No. 6, as quoted above, empowers the Board of Trade from time to time to make, amend, or repeal regulations for securing public safety. It also empowers the local authorities to make by-laws on the same subject. In the model order (clause 6) the Board of Trade reserve their right to make such regulations in the future, but beyond stating that the undertakers' system of supply must be approved by the board, and imposing a heavy penalty, under clause 42 (see below, F), for using any line after it has been prohibited as dangerous, no special regulations have been laid down on this subject. The board have, however, undertaken in a letter addressed to the London county council, dated 12th June, 1889, to issue regulations to guard against danger from currents of high tension. Under (1882) No. 14, a court of summary jurisdiction is empowered, upon complaints made, to order the removal of any overhead wires which are, or appear likely to become, dangerous, notwithstanding that the same may have been erected with the consent of the local authority (see also the special provision in London orders noted at the end of B).

F.—*Testing mains, service lines, etc.*

One or more competent impartial persons are to be appointed electric inspectors for the purpose of inspecting lines and works and certifying meters. The appointment is to be made by the London county council, unless they are them-

*This differs in language from clause 9 of the model order, and omits the qualification contained in the latter, requiring that circuits laid after those of the undertaker's must, in order to claim the benefit of the clause, have been laid with reasonable precautions.

selves the undertakers, in which case, or if they fail to appoint, the Board of Trade will appoint on the application of any consumer (clauses 28 and 29). In provincial cases the local authority, or, if they are the undertakers, a court of summary jurisdiction take the place of the London county council.

Inspectors' remuneration is to be fixed by the London County Council, and is to be in addition to or in substitution for their fees hereafter mentioned, which, in the latter case, are to be received on behalf of the county fund, or local rates, as the case may be (clause 30).

Inspectors are to test mains for insulation and conductivity when required by the authority appointing them, but not in regard to any particular portion more than once in three months, unless by special order of the Board of Trade. When required by any consumer, they are to make the like tests as regards service lines and the efficiency of joints, and such other tests in relation to such lines as may from time to time be approved by the Board of Trade (clauses 31 and 32).

The testing is to be carried out in such manner as the inspector thinks fit, and at such suitable hours as in his opinion will least interfere with the supply, but he is not, without a special order of the Board of Trade, to have access to the mains at other points than those reserved by the undertakers for their own access. The undertakers are to have notice before testing, and are not to be responsible for interruption of the supply caused or required by the inspector (clause 33).

A report of the test is to be made on the following day to the undertakers and the party requiring the same, and is to be received in evidence. Either party may appeal against it to the Board of Trade, whose decision is final (clause 44).

The undertakers must establish such testing stations as may be reasonably required by the London county council, and place instruments therein approved by the Board of Trade, and make proper connections, and supply energy for testing. Any dispute between the London county council and the undertakers as to what may reasonably be required under this clause is to be settled by arbitration (clause 35).

Undertakers must set up at all places where they supply energy by distributing mains such instruments, and keep such records of their readings, as the Board of Trade may require, which records are to be received in evidence (clause 36). They must keep in efficient order the above instruments, and those at testing stations.

Any electric inspector may examine and record the reading at such times and in such manner as the said authority may appoint, and such record is to be evidence (clause 37), and he has right of access at all reasonable hours to the testing places and premises of the undertakers for the purpose of testing their lines and instruments and ascertaining if they are in order, and, if not, he may require them to be put in order forthwith (clause 38).

The undertakers' representatives may be present at all tests and inspections, but may not interfere therein (clause 39).

The expense of testing, including such reasonable fees to the inspector as may be prescribed by the local authority, with approval of the Board of Trade, are to be paid by the undertakers, unless his report, or, on appeal, the Board of Trade shall decide that the local authority or any consumer is at fault, in which case payment is to be made by the latter, as a court of summary jurisdiction may direct (clause 40).

Default by the undertakers to afford all facilities for the execution of the above provisions, or otherwise, in complying therewith, involves a penalty of £5, and £1 for each day's continuance after the first (clause 41).

The Board of Trade may order the undertakers to remedy any defect in their mains, lines, or works which are not in accordance with the regulations and conditions prescribed, under penalty of £20 a day for neglect to comply with the order. If the defect is considered dangerous the order may prohibit the use of the defective main, line, or work, under penalty of £100 a day for disobedience (clause 42).

4. RIGHTS OF THE PUBLIC TO OBTAIN SUPPLY, AND THEIR OBLIGATIONS IN CONNECTION THEREWITH.

It is enacted by (1882) No. 19, that every one within the undertakers' area shall be entitled to a supply of electricity upon the same terms, "except in so far as is otherwise provided by the license, order, or special act." Section 6 (a) also provides for conditions being inserted with regard to "the limits within which and the conditions upon which the supply is to be compulsory or permis-

sive." By virtue of these sections full provisions on the subject have been inserted in the model order, which must be taken to be substituted for the more sweeping obligation that would otherwise exist under section 19. These provisions are as follows:

A.—*Compulsory distributing mains to be laid.*

Undertakers must within two years lay suitable and sufficient distributing mains for the purpose of general supply throughout certain scheduled streets (clause 19). At any time after the first eighteen months, they may also be required to lay such mains in every street within their area, upon the following conditions being complied with. A requisition in a form to be supplied gratis by the undertakers must be served upon them by six or more owners or occupiers in the street specified, or by the local authorities controlling public lamps therein. In the former case, if the undertakers within fourteen days after service so demand, the requisitionists must within fourteen days after such demand, or after an arbitrator's award, bind themselves to take such a supply for three years, as will at current charges to ordinary consumers pay a reasonable annual sum, to be specified in the demand, and must also, if the demand so requires, give security for payment thereof.

Disputes as to the reasonableness of the sum or security demanded are to be settled by arbitration, but the sum is not to be "less than 20 per cent upon the expenses of providing and laying down the required distributing mains, and any other mains or additions to existing mains which may be necessary for the purpose of connecting such distributing mains with the nearest available source of supply." A local authority must, within fourteen days after serving such a requisition, tender an agreement to take a supply for three years for such lamps in the street as they control. The mains must be laid within six months of the above formalities being completed (clause 20, 22, 23, and 24).

B.—*Right of consumers to obtain supply.*

Any owner or occupier within 50 yards of a distributing main may require the undertakers "to give and continue" a supply to his premises, by serving them with a notice specifying the premises, the maximum power to be supplied, and a reasonable date for commencement of the supply. The undertakers must thereupon lay the necessary lines, but the consumer must pay the cost of the lines laid upon his property, and of so much outside it has exceeds 60 feet from the main. He must also contract for three years' supply of a sufficient amount to pay at least 20 per cent per annum on the undertakers' outlay on such lines, and find security for such payment if required.

The maximum demanded must be reasonable, and must not be altered without a month's notice to the undertakers, and payment of all expenses consequent on such alteration. The undertakers may refuse the supply, unless reasonably satisfied that the consumer's fittings are in good condition, and may cut off the supply so long as the consumer uses it in such a way as to improperly interfere with the supply to others. Differences as to the reasonableness of the security required or offered, or as to the alleged defects in fittings, etc., or in proper use of the supply, are to be settled by arbitration (clauses 43 and 44). Also (1882) No. 18, while forbidding undertakers to prescribe any particular form of lamp, provides against improper use of the supply.

The London orders granted in 1889 contain an additional clause, providing that when undertakers propose to lay a line in any street for supplying a particular consumer, and not for general supply, they must give twenty-eight days' notice to the local authority and all persons whose premises such line will pass. Thereupon, if two or more of such persons so require, in accordance with the provisions above stated, the undertakers must lay a distributing main.

C.—*Supply to public lamps.*

The undertakers must, on reasonable notice from the local authority, supply any public lamp within a distance of 75 yards from any distributing main (clause 45).

D.—*Penalties.*

Default in complying with obligations A entails a penalty of £5 a day, and if the Board of Trade are of opinion in any case that such default is willful and unreasonably prolonged, they may, upon application of the local authority, revoke the

as to the whole, or with the consent of the undertakers, any part of the
f supply (see No. 1 F). The penalties under B and C are 40*s.* a day for
default as regards private consumers, and the same for each public lamp,
al penalties not to exceed £50 a day in respect of defaults not being willful.
alty is to be inflicted if the default is caused by inevitable accident or *force*
e, or is of an unimportant character.

E.—*Method of charging for supply.*

dition to the provisions of (1882) No. 19, before referred to, section 20 de-
that the undertakers shall not, in making any agreements for supply, show
due preference, but save as aforesaid, they may make such charges as may
eed upon not exceeding the limits of price imposed by the license, order,
ial act.
model order draws a distinction between "general supply," *i. e.*, the sup-
ordinary consumers, and "supply to one or more consumers under special
nent" (clause 2), and provides that, subject to the right of consumers to be
d according to one of the methods hereafter described, undertakers and
ners may make what agreements they please as to price and mode of charg-
ause 49).
laid down by clause 51 that the value of the supply to any ordinary con-
shall, except as otherwise agreed between such consumer and the under-
, be ascertained by a "certified meter," as hereafter defined.
supply to ordinary consumers is to be charged for in Board of Trade
measured either—
By the actual quantity of energy supplied, *i. e.*, the meter must measure
nits directly; or
By the electrical quantity supplied, in which case the units are to be ascer-
by the product of the ampère-hours indicated on the meter, and the stand-
essure† at the point of junction with the distributing mains, this product
livided in the case of transformers by the ratio of transformation; or (un-
ie Board of Trade otherwise direct)
By the number of hours during which the supply is actually used by each
ner, in which case the units will be ascertained by the product of the time
ie maximum power which the consumer has specified for.
ore commencing supply through any distributing main, undertakers must
otice to the local authority by what method they propose to charge for
through that main. They must give a month's notice both to the local
rity and every consumer supplied from it before changing the method, and
ee clause 60) pay consumers' reasonable expenses if a change of meter is
ed.
ere, however, the undertakers have chosen the third method, consumers
fter giving a month's notice, insist on being charged by the first method
e 47).

F.—*Maximum price.*

s is to be 13*s.* 4*d.* per quarter for any quantity up to 20 units, and beyond
d. per unit, but the Board of Trade may, on the application of the London
y council, or the local authority, or the undertakers, revise these prices,
method of charging. every seven years (clause 48).
B.—The above prices will not necessarily be applied to provincial orders.)
price for public lamps is to be settled by agreement with the local author-
, failing that, by arbitration, regard being had for the circumstances of the
he distributing mains which have been laid for the purpose, and the prices
ed to ordinary consumers in the district (clause 50).

G.—*Recovery of charges.*

rges for supply or for meters or fittings may be recovered summarily as a
lebt, but not as a penalty. returns of section 40 of the gas-works clauses
871, being limited in this respect by (1882) No. 12. The matter would

unit is defined as the energy contained in a current of 1,000 ampères flowing under an
of one volt during one hour.
† expression is not defined by the model order, but in the schedules to the London orders
1 in 1889 it is stated to mean such a constant difference of potential corresponding points
positive and negative distributing mains as may be fixed by any regulations under such

therefore be dealt with under the summary jurisdiction act, 1879. Arrears due from an outgoing tenant can not be recovered from the incoming tenant, unless the two tenants have so agreed (gas-work clauses act, 1871, section 39). Under (1882) No. 21 the supply may be cut off until arrears, with expenses of cutting off, are paid.

H.—*Security to be given by consumers.*

A consumer's supply may also be cut off under clause 43 if he neglects to give security for his future payments, for seven days after notice from the undertakers requiring him to do so.

In this and other cases, where a consumer is required to give security, the amount and nature of the security, whether by deposit or otherwise, is, in default of agreement, to be settled by a court of summary jurisdiction. In case of a deposit the undertakers must pay 5 per cent interest on every sum of 10s. deposited for every six months it remains in their hands (clause 68).

I.—*Meters, etc.*

A "certified meter" is defined by clause 52 as a meter certified by an electric inspector (appointed as aforesaid, No. 3, F) to be of some pattern and to have been fixed and connected with the service lines in some manner, approved by the Board of Trade, and to be a correct meter. If the meter is altered, unfixed, or disconnected, it ceases to be "a certified meter" until recertified. Inspectors are, when required by the undertakers or any consumer, and on prepayment of such fees as may be prescribed by the London county council, with the approval of the Board of Trade, to examine any meter and certify the same, if he considers it entitled to be so certified (clause 53).

Undertakers must, if required by a consumer, supply, fix, and connect an appropriate meter and get it certified. They may require prepayment of a reasonable sum for the incidental expenses; also for the price of the meter, or security to be given, or a higher agreement entered into. Any differences under this clause are to be settled by arbitration (clause 54).

Consumers may not connect or disconnect any meter to be used as aforesaid without forty-eight hours' notice to the undertakers, under penalty of 40s. (clause 55).

They must keep their own meter in proper order at their own expense; otherwise the undertakers may discontinue the supply. If such meter be found, on examination by the undertakers, not to be in proper order, the expenses of taking off, removing, testing, inspecting, and replacing the same, and procuring it to be certified, are to be paid by the consumer; otherwise by the undertakers (clause 56).

Undertakers may let meters on hire (see No. 2, D). Unless otherwise agreed, the undertakers are to keep a hired meter in repair at their own expense, and the consumer need not pay rent for it while defective. Differences between undertakers and consumers as to a meter being in proper order, or as to the value of the supply, are to be decided by an electric inspector, who may order by whom the costs of proceedings before him are to be paid, and whose decision is final. Subject, as aforesaid, the register of the meter is to be conclusive evidence, in the absence of fraud, of the value of the supply. If the London county council are the consumers in question, then a Board of Trade inspector is to be called in.

It will be observed that undertakers have no power to prescribe any particular form of meter, but, subject to the above provisions, consumers may use what meters they please. Undertakers may, however (see clause 61), place a second meter at their own expense upon the consumers' premises, being of a pattern and fixed and connected in a manner approved by the Board of Trade. This, except by agreement, can only be placed between the mains and the terminals of the consumers' premises.

J.—*Rights of entry on consumers' premises.*

The right of entry upon consumers' premises is given to undertakers by (1882 No. 24 at all reasonable times, to inspect, fix, connect, test, take off, or replace lines, meters, accumulators, fittings, works, and apparatus belonging to them and to ascertain the quantity consumed or to cut off supply and remove their property, they making good all damage caused thereby.

rged with lighting.
ıe section and schedule also define the term "local rate."
owing rights and powers of local authorities have been already re-

of veto, absolute as to a license, and qualified as to a provisional order. 1.)
of compulsory purchase. (See provisional order, Part 1, and No. 1, F.)
ıt to receive notice before streets, etc., are broken up and to do the rs' work therein themselves. (See No. 3, A.) These provisions are ı the model order under a special authority given by (1882) No. 3, sub-

tandi to oppose extensions of undertakers' time, or revocation of their amalgamation of undertakings, No. 1, C., F., and G.
ghts and privileges must now be stated.
authority may themselves be undertakers either under a licens (1882) ı provisional order (1882) No. 4, and the Board of Trade will prefer her applicants, unless there is good reason to the contrary (Rule 2). ence would not apply to an application so far as it might extend to an ıd the local jurisdiction of the applicants. Under (1882) No. 3, subsec- y may not apply for powers except in pursuance of a resolution passed l meeting, held after a month's previous notice of the same, and of the thereof.
alterations will obviously be necessary in some of the terms of the er to meet the case of the undertakers being the local authority. The taken from the Swansea order, 1890, may be noted:
, as to security and accounts, is omitted, and, of course, also all pro- to undertakers obtaining the consent of, or having their powers exer- he local authority, and as to the compulsory supply to public lamps ice therefor. A special clause is inserted giving powers to acquire use the same, or any already possessed, for the purposes of the under- d a clause providing that surplus revenue is to be applied to public im- ts or reduction of loans, but that any access beyond 5 per cent on penditure is to go to reduction of the price of supply. No penalties ibed for default in laying compulsory mains, except the liability to re- f the order, and the undertakers are expressly absolved from all pro- whether civil or criminal, in respect to such default. In the testing court of summary jurisdiction occupies the position of the London ıncil. In other provincial orders where the local authority are not takers, they themselves occupy this position.
obiained a license or provisional order, a local authority may con- any company or person for the execution and maintenance of the works r for the supply of electricity, but they can not assign their powers

dition to any regulations issued by the Board of Trade, but confirmation by the Board of Trade is necessary to to their validity.

Under clause 18 of the model order, as embodied in the London orders granted in 1889, a local authority owning any subway may serve notice on undertakers requiring them to use the same for laying their lines, and after such notice the undertakers so served may not break up any street where there is a subway, and must pay a reasonable rent for the use thereof, to be settled by arbitration in default of agreement.

COUNTY COUNCILS.

It will have been seen that county councils are not local authorities, with the single exception of that comparatively small part of London which the late metropolitan board of work were authorized to light. The position, therefore, occupied by the London county council under the model order is quite anomalous, being wholly uncontemplated by the electric-lighting act and the gratuitous creation of the Board of Trade.

County councils have a *locus standi* to apply for clauses in provisional orders or licenses, so far as their interests are affected; but in drafting such documents for the provinces, the name "county council" may be omitted from the model order, and except where the two bodies are mentioned in conjunction, the name "local authority" substituted.

The following rights and powers of the London county council, under the model order, have already been noticed:

Protection of their sewers, roads, bridges, etc., No. 3, A and B.

Restrictions on overhead wires, No. 3, D, and control over distributing boxes No. 2, F.

Rights to the deposits of maps No. 1, A.

Appointment of electric inspector and general control of the testing of mains, etc., No. 3, F.

It is to be remarked as to this last, that while the fees of inspectors for testing mains are to be fixed by the local authority, those for certifying meters are to be fixed by the London county council. (See clauses 40 and 53.)

The council have also the same rights of requiring undertakers to lay their lines in subways belonging to the council, as have been stated to be possessed by local authorities.

POSTMASTER-GENERAL.

The rights and property of the postmaster-general are carefully preserved by the acts and model order.

(1882) No. 35 precludes any clause being inserted in a license or provisional order, which would affect his telegraphic monopoly.

(1882) No. 26 provides that none of his lines may be altered, except subject to the telegraph act, 1878, of which sections 2 and 7 to 12 are incorporated; that undertakers must not lay any line or do other work which might injuriously affect the postmaster's lines, either by induction or otherwise, or which come within 10 yards thereof, without giving him not more than twenty-eight or less than seven clear days' notice, specifying the course and gauge of the proposed lines, and they must conform with his reasonable requirements, to be settled by arbitration in case of difference. Repairs and connections with mains where the direction of the line to be laid crosses a line of the postmaster at right angles at the nearest point, and so continues for 6 feet on each side thereof, are excepted from these provisions.

The penalties for breach are the same as those under the provisions stated in No. 3, A, and a penalty of £50 a day is added for willfully interrupting telegraphic communication. Undertakers are, however, absolved from penalties if the case was one of emergency and they have given immediate notice at the nearest postal telegraph office stating why they proceeded without statutory notice.

Under the telegraph act, 1878, the postmaster-general can give a counter-notice to the undertakers, stating either that he will do their work for them or requiring them to proceed under his supervision. In either case they are to pay his expenses.

(1888) No. 4, also gives the postmaster-general jurisdiction over the electric lines of persons who are not undertakers under the acts, and may require these to be used only in accordance with such conditions and regulations as he may

prescribe, under penalty of £20 for neglect, and removal of the offending line upon the order of a court of summary jurisdiction.

Under the Board of Trade regulations as to aërial conductors mentioned in part 1, a plan of all such conductors must be lodged with the postmaster-general.

RULES OF THE BOARD OF TRADE WITH RESPECT TO OVERHEAD WIRES.

The following are the regulations for the protection of the public safety and of electric lines and works of the postmaster-general, and of other electric lines and works, prescribed by the London Board of Trade, under the provisions of the electric-lighting act, 1888:

In these regulations the words, terms, and expressions to which by the electric-lighting acts, 1882 and 1888, meanings are assigned, shall have the same respective meanings, provided that in these regulations:

"Energy" means electrical energy, and for the purposes of the electric-lighting act, 1888, and these regulations, electrical energy shall be deemed to be an agency within the meaning of the word electricity, as defined in the electric-lighting act, 1882.

"Conductor" means an electric wire or line for the supply of energy.

"Aërial conductor" means a conductor which is placed above ground and in the open air.

"Low-pressure conductor" means a conductor in which the difference of electric potential either between that conductor and earth, or between that conductor or any part thereof and any other conductor on the same poles or supports, does not exceed 300 volts, if the supply be on the continuous-current system, or the equivalent of 150 volts if on the alternating-current system. A difference of potential on the alternating-current system shall be deemed to be the equivalent of a difference of potential on the continuous-current system, when it produces an equal heating effect if applied to the ends of a thin-stretched wire or carbon filament.

"High-pressure conductor" means a conductor in which the difference of electric potential as above described is greater than that of a low-pressure conductor.

REGULATIONS.

Height from ground and distance from buildings.

(1) An aërial conductor in any street shall not in any part thereof be at a less height from the ground than 20 feet, or where it crosses a street, 30 feet, or within 6 feet of any building for the purpose of supply.

Maximum intervals between supports.

(2) Every aërial conductor shall be attached to supports at intervals not exceeding 200 feet where the direction of the conductor is straight, or 150 feet where the direction is curved, or where the conductor makes a horizontal angle at the point of support.

Supports, construction, and erection of.

(3) Every support of aërial conductors shall be of a durable material, and properly stayed against forces due to wind pressure, change of direction of the conductors, or unequal lengths of span, and the conductors and suspending wires (if any) must be securely attached to insulators fixed to the supports. The factor of safety for the suspended wires shall be at least 6 and for all other parts of the structure at least 12, taking the maximum possible wind pressure at 50 pounds per square foot. No addition need be made for a possible accumulation of snow.

Connection of support to earth.

(4) Every support, if of metal, shall be efficiently connected to earth, and if of wood or other nonconducting material, shall be protected from lightning by a lightning conductor fastened to the support along its entire length, and projecting above the support to a height of at least 6 inches, such lightning conductor being efficiently connected to earth.

Efficient earth connection defined.

A support shall be efficiently connected to earth when it is connected to metallic mains for water supply outside of buildings, or, where these are not available, to a mass of metal having a total surface of at least at 4 square feet, buried to a depth of at least 3 feet in moist earth, provided that in either case the connecting conductor must possess a mechanical strength, and offer a passage to electrical discharges, equal to that of a strand of seven No. 16 galvanized iron wires.

Lightning protectors.

(5) Every aerial conductor shall be protected by efficient lightning protectors of pattern approved by the Board of Trade.

Angle of crossing thoroughfares.

(6) Where any conductor crosses a street the angle between such conductor and the direction of the street at the place of such crossing shall not be less than 60 degrees, and the spans shall be as short as possible.

Crossing other wires.

(7) Where any aerial conductor is erected so as to cross any other aerial conductor, or any suspended wire used for purposes other than the supply of energy, precaution shall be taken by the owners of such crossing conductor against the possibility of that conductor coming in contact with the other conductor or wire, or of such other conductor or wire coming into contact with such crossing conductor by breakage or otherwise.

Maximum working current.

(8) The maximum working current in any aerial conductor shall not be sufficient to raise the temperature of the conductor in any part to such an extent as to materially alter the physical condition or specific resistance of the insulating covering, if any, or in any case to raise such temperature to a greater extent than 30° F, and efficient automatic means shall be provided which will render it impossible for this maximum working current to be by any accident exceeded to the extent of 25 per cent, even for short intervals of time; and special care shall be taken that the cross sectional area and conductivity at joints is sufficient to avoid local heating, and that the joints are protected against corrosion.

High pressure conductors to be insulated.

(9) Every high pressure aerial conductor must be continuously insulated with a durable and efficient material, to be approved by the Board of Trade, to a thickness of not less than one-tenth part of an inch, and in cases where the extreme difference of potential in the circuit exceeds 2,000 volts, the thickness of insulation must not be less in inches or parts of an inch than the number obtained by dividing the number expressing the volts by 20,000. This insulation must be further sufficiently protected on the outside against injury or removal by abrasion. If this protection be wholly or partly metallic it must be efficiently connected to earth, so, however, as not to cause undue disturbance to other electric lines or works by electrostatic induction or otherwise.

Specification of insulation.

(10) The material used for insulating any high pressure aerial conductor must be such as will not be liable to injurious change of physical structure or condition when exposed to any temperature between the limits of 10° and 150° F., or to contact with the ordinary atmosphere of towns or manufacturing districts.

Minimum insulation resistance allowable.

(11) The insulation resistance of any circuit using high pressure aerial conductors, including all devices for producing, consuming, or measuring energy, connected to such circuit shall be such that should any part of the circuit be put to earth, the leakage current shall not exceed one twenty-fifth of an ampère in the case of continued current, or one-fiftieth of an ampère in the case of alternating currents.

Indicator of leakage.

Every such circuit containing high pressure conductors shall be fitted with an indicating device which shall continuously indicate if the insulation resistance of either conductor fall below the conditions required by this regulation.

Suspension of conductors.

(12) Every aerial high pressure conductor shall be efficiently suspended by means of nonmetallic ligaments to suspending wires so that the weight of the conductor does not produce in it any sensible stress in the direction of its length, and the insulating conductors and suspending wires, where attached to supports, shall be in contact only with material of highly insulating quality, and shall be so attached and guarded that, in case they break away, it will not be possible for them to fall away clear of the support.

Protection of telegraph and telephone wires from interference.

(13) In the case of aerial conductors carrying alternating currents, the two conductors constituting the line and return for any circuit shall be run parallel with each other, and at a distance apart not exceeding 18 inches.

Owner of conductor responsible for supports.

(14) The owner of every aerial conductor shall be responsible for the efficiency of every support to which such conductor is attached, and every support shall be efficiently marked with such mark indicating the ownership of the conductor as the Board of Trade shall approve.

Maintenance.

(15) Every aerial conductor, including its support and all the structural parts and electrical appliances and devices belonging to or connected with such conductor shall be duly and efficiently supervised and maintained by or on behalf of the owners as regards both electrical and mechanical condition.

Unused conductors to be removed.

(16) An aerial conductor shall not be permitted to remain erected after it has ceased to be used for the supply of energy, unless the owners of such conductor intend, within a reasonable time, again to take into use.

(17) Every aerial conductor shall be placed and used with due regard to electric lines and works from time to time used, or intended to be used, for the purpose of telegraphic communication or the currents in such electric lines and works, and every reasonable means shall be employed in the placing and use of aerial conductors to prevent injurious affection, whether by induction or otherwise, to any such electric lines or works or the currents therein.

(18) (a) A notice describing every aerial conductor erected or used for the supply of energy shall forthwith, upon receipt of these regulations, be served upon the postmaster-general, together with a plan showing the mode and position in which such conductor is erected.

(b) The postmaster-general, upon consideration of such notice and plan, may require such alteration in the position or mode of erecting, or mode of use of such conductor, or compliance with such other conditions as he may think fit, having regard to the protection of the electric lines or works of the postmaster-general, and any failure on the part of the body or person owning or using, or entitled to use, the said conductor to comply with such requirements, shall be deemed to be a noncompliance with these regulations.

(c) Any notice required to be served upon the postmaster-general under these regulations may be served by being addressed to him and left at, or transmitted through the post to, the general post-office, London, and any notice required to be served on the body or person owning or using, or entitled to use, any aerial conductor may be served by being addressed to such body or person and left at, or transmitted through the post to, their or his office or last known place of address.

PARIS.

AUTHORIZATION REGARDING THE PLACING OF THE ELECTRIC CONDUITS UNDER THE PUBLIC STREETS OF PARIS.

SPECIFICATIONS.

ARTICLE 1.

Mr. (if the grant is made to a company the name of the representative of the company (the signor of the application) shall be supplemented by the exact name of the company and the indication of its place of incorporation), residing at ———, is authorized to place underground, under the drives and sidewalks in the section determined by the streets indicated on plan A, hereto annexed, the wires and cables intended for the transmission of electric currents for the production of light or transmission of power, and to carry out under the supervision of the administration all the work necessary for that under system of conduits.

No authorization or concession for electric lighting shall be granted except to Frenchmen or French companies incorporated in France.

ARTICLE 2.

The wires or cables shall not be placed in the sewers or subterraneous galleries under Paris.

They shall be placed below the sidewalks, in conduits made of earthenware, masonry, metal, or any material sufficiently durable and accepted by the municipal council upon advice of the administration.

The position, the depth, and the maximum exterior diameter of these conduits shall in each case be determined by the administration, which shall take account for this determination, not only of underground conduits already established under the same sidewalk, but also and especially of those which it might reserve for itself for establishment in the future for municipal purposes, it being understood that the conduits of the municipal electrical service shall be nearest the surface. The licensee shall not be allowed to bring any claims by reason of the refusal of permission to pass through certain streets for want of space beneath the sidewalks under conditions above indicated, or for the purpose of municipal reservation.

The wires or cables shall not be placed below driving ways except to cross the streets. These crossings must have a depth of at least one meter.

There shall be established a conduit under each sidewalk alongside of the buildings to be served, so that the house connections shall never cross the street.

No exception shall be made to this rule except in streets of a size regarded as insufficient by the municipal council.

Manholes shall be placed at certain distances to allow of access to the pipes, and these latter shall be placed in such a manner that, in case of damage, by using the manhole the wires can be renewed and replaced without excavation. The location and disposition of the manholes shall moreover be determined by the administration. In every case they shall be covered with tarred lids.

A manhole must be placed at either end of each crossing of cables under the streets. For crossing broad and frequented driving ways, and especially if the street is concreted, a manhole must be placed at both ends of the crossing and the administration may further require that these manholes shall be connected passages, the form of which it shall determine, and which in no case shall be connected with the sewers and special branches.

If the passage intersects a sewer, the cable shall pass over the sewer. Nevertheless, if the available height between the sewer and the pavement is insufficient, or if the pavement is of wood or asphalt, the cable may pass through the sewer in a sheath.

If several companies should be authorized to make use of the same sidewalk, the cables of the different companies may be placed in a common conduit, constructed at common expense, the dimensions and arrangements of which must be approved by the administration after advice of the municipal council.

ARTICLE 3.

The wires and cables shall be placed at a distance of not less than 1 meter from the house fronts, this space being reserved for the municipal electric system, and when the administration, after deliberation of the municipal council, shall have established—

(1) That the locality shall not be injured.

(2) That, regard being taken of the intensity of the current and the nature of the insulating envelopes, they may be placed there without danger to persons and without inconveniencing the work of the different public services.

The above-mentioned reservation of 1 meter may be reduced by the municipal council in streets where the width of the sidewalk has been decided to be insufficient.

ARTICLE 4.

The wires entering the building shall be laid between the main cable and the house front in conduits joined to those of the main cable.

All arrangements other than branch wires, such as circuit breakers, etc., shall be placed outside the limits of the public streets.

ARTICLE 5.

If transformers are employed they must be placed outside the public street.

ARTICLE 6.

Before commencing each portion of conduit under the public streets the plans must be presented to the municipal council and to the administration in fivefold copy by the licensee, who shall not commence work before being notified of the acceptance of his plans.

To make them out properly, information may be obtained at the bureau of engineers, about all matters of which the administration has control as regards water pipes or gas pipes or other conduits already authorized, the sewers and special branches, existing or projected grades, etc., but he can in no case hold the administration responsible for any mistakes, imperfections, or omissions which may be found in documents put at his disposal, nor for any material difficulties which may arise in the execution of the work.

ARTICLE 7.

The licensee shall keep constantly open to inspection a plan, on a scale of 1:1,000, of this system of conduits. Each house branch shall be marked thereon with the number and class of lamps which it feeds, or the number of horse-powers which it supplies. This plan shall be completed by indicating the purpose and composition of the cables, the nature, the dimensions, and location of the conduits, etc. The special arrangements adopted for particular points of the system shall be shown by detail drawings on a scale 1 : 20 or 1 : 50, especially where they encounter sewers, branches of water, or gas mains, also at the crossings of the street.

This plan must be given in four copies, which shall be revised and brought up to date every six months.

ARTICLE 8.

Three days before commencing work upon any conduits the licensee shall notify the engineers of the municipal service. The like shall be done for any work of maintaining or repairing the conduits except when it concerns examination in case of accident, for which notice may be given the same day.

The licensee shall notify simultaneously the president of the municipal council and the administration of the modification which he wishes to make in his conduits, or which, in case of urgency, shall have been made by him, in agreement with the administration.

ARTICLE 9.

The licensee shall pay to the city treasury the bills levied quarterly, which shall be submitted for his acceptance, for the expenses of (complete) final restoration of the public roads made necessary by opening the trenches either for the first establishment or for keeping in order, or for taking up of conduits. These expenses shall be fixed by contract according to the following basis:

Streets:

		Francs.
Paving with stone on sand	per square meter	4
Paving with stone on concrete	do	8
Ballasting		3
Lining with compressed asphalt	per square meter	16
Paving with wood	do	20
Sidewalks and driveways:		
Paving with granite	do	4
Paving with bitumen	do	6
Paving in stone to enter gateway	do	5
Sanding and repaving driveways		1
Straight and circular curbstones of all dimensions	per linear meter	5

Immediately after the execution of the work and until the definite acceptance, the licensee shall re-establish and maintain temporary thoroughfare over the trenches opened by him; such maintenance shall not, however, at his expense be prolonged for more than two weeks after the completion of the work in each street.

All reconstructions of public works made necessary by the establishment of the conduits and not included in one of the categories above defined, shall be levied in cost drawn up according to the actual expenditure ascertained by appraisal.

ARTICLE 10.

The licensee shall be obliged to conform in the execution of the work to the municipal regulations of the departments of the public roads and of the walks or of the water supply and public health.

He shall besides be subject in a general way, both in regard to the establishment and the working of the system, to all the rules and decisions which are or shall be in force during the term of the franchise.

ARTICLE 11.

The present franchise is granted for the term of eighteen years, to commence at date of notification or approval, without monopoly or any privilege whatever, the city of Paris reserving the absolute right to grant other franchises of the same kind, even in the extent of the system of streets to which the present franchise applies.

ARTICLE 12.

The city of Paris binds itself to reserve for the licensee, to the exclusion of all others, during the duration of the franchise, the actual space which shall have been used for his system of conduits.

But it reserves the right to order, and even in case of urgency, to displace or remove at the expense of the licensee, any given parts of the conduit system whenever the interest of public or municipal service shall require it. The licensee shall be requested at least five days in advance, excepting in the case of extreme urgency, to remove or displace the same, and in case of nonfulfillment the city of Paris can proceed at the expense of the licensee and without his having any right to indemnity.

The licensee shall, on the other hand, be authorized in similar case to restore the system of conduits, condition to be determined by the administration.

Excepting in cases of evident emergency, the municipal council shall be called upon for its views every time a change of the system of conduits is proposed.

ARTICLE 13.

The licensee shall have absolute control of his charges, but shall not exceed a maximum of 0.045 franc per carcel hour, or 0.45 franc for a quantity of electric energy furnished to the subscribers and equivalent to one horse-power per hour.

The electricity furnished may also be estimated, at the demand of the subscriber, either in Watt hours or in ampère hours at a given tension. In that case the charge shall be at a maximum of 0.15 franc per hundred Watt hours.

The licensee must have subscription contracts approved by the administration, in which the intensity of light must be expressed in carcels. Each of these contracts shall contain the following clause:

"The present contract shall be null and void if the licensee is not in a position to furnish electricity at not to exceed two months after another licensee, able to furnish it, shall have put his plant in the street occupied by the subscriber to this agreement."

The city of Paris reserves the right to lower the maximum price, fixed above, every five years from date of notification of the approval of franchise by the prefect.

Action shall be taken upon each franchise in such revision, which shall be based upon the reduction in cost attained by the use of the latest improvements.

The lowering of the tariff shall benefit all consumers, whatever may be the conditions of their contracts.

The lowering of prices shall be determined by a board of four members, two appointed by the prefect of the Seine, after the approval of the municipal council; two by the licensee.

In case of disagreement a fifth expert shall be appointed by the president of the civil court.

The decision of this board shall not be effective except after the approval of the municipal council.

In case of nonappointment of two experts by the licensee, such appointment shall be made by the president of the civil court.

The contracts, the supplements, and all the documents or agreements whatever passed between the licensee and the subscribers shall be made out in triple copies, of which one copy, signed by the company and the subscriber shall be given to the city of Paris.

All the lowering of tariff granted by the licensee to his subscribers shall be considered as if made until the expiration of the franchise, and the tariff can not be raised.

Every licensee shall, on demand of the city, in the area covered by his franchise, furnish for public lighting arc lights at the maximum tariff of 0.025 franc per carcel hour.

ARTICLE 14.

The licensee shall be obliged, except in special cases, when the administration reserves the right to itself to decide, after consulting with the city council, to furnish electricity at the rate of his contract wherever his distributing cables are, to all persons demanding it.

The licensee has absolutely no right to prescribe to his subscribers concerning their interior arrangements.

ARTICLE 15.

The licensee shall be obliged to put up at his cost all installations necessary for photometric measurements and all other tests as the municipal council or the administration shall judge desirable.

ARTICLE 16.

The licensee shall pay quarterly to the city during the time of the grant:

(1) A rent of 100 francs per year for each kilometer, or fraction thereof, of longitudinal conduit put under the sidewalks.

(2) A levy of 5 per cent on all the proceeds either by the ascertained amount of the subscriptions or by the indications of the meters, for lighting as well as for motive force. For this purpose the licensee shall give the state a quarterly account of the proceeds and a drawback of outstanding bills during the month

following the completion of the quarter. There shall not be made any deduction for bad debts, but there shall be kept account of the cessation of subscriptions regularly reported by the licensee.

ARTICLE 17.

When electricity is produced in factories outside of Paris, the levy on the gross proceeds shall be increased 1 per cent.

If the duty on coal shall change in any way the rent shall vary in proportion.

ARTICLE 18.

The licensee shall pay quarterly the dues hereabove determined with a re prieve of eight days from the notice which shall be given him to this effect. He must put at their disposal the books and substantiating documents which they need.

ARTICLE 19.

The cost of supervision to be exercised by the city shall be at the charge of the licensee, payable before the middle of January and entirely acquired by the city from that time.

ARTICLE 20.

The franchise shall be canceled after consulting with the municipal council

(1) If the licensee transfers openly or clandestinely to a third person or to an other licensee all or parts of the rights and obligations resulting from the specifications, without an express permit in writing of the prefect of the Seine, after advice from the municipal council.

(2) If he has not commenced his work within the term of six months from the date of his franchise, and if, within the term of two years he is not able to furnish the required electricity on all the roads indicated on plan B hereby annexed

(3) If, on the other streets forming the perimeter of the section or the interior of the section, the licensee will not extend his conduit and will not furnish electricity at the rate of his subscription every time that the demand shall amount to 750 Watts during 750 hours per year for 10 meters of conduits.

(4) If, during the duration of his franchise, he shall stop the distribution of electricity on the whole or part of his system without having been authorized previously by a resolve of the municipal council.

(5) If the licensee does not conform to the obligations imposed by these specifications.

In case of failure of the licensee the present franchise shall become null and void, the city besides reserving the right to appoint other patentees or to exercise the power of buying in.

ARTICLE 21.

The city of Paris reserves the right of buying in at any time after the expiration of the first ten years of the term of the franchise.

The price of buying in shall be determined in the following manner:

(1) The average annual net produce obtained by the licensee during the three years preceding the year of the buying in shall be calculated.

This net produce shall make the standard of an annuity which shall be due and paid to the licensee during each of the remaining years of the term of the present franchise.

It is lawful for the city to clear itself at any moment from the remaining annuities to be paid of the buying in, in paying the capital representing the actual value of the annuities with a deduction of a discount of 5 per cent.

In regard to the conduits, the machines and apparatus of every kind, the tools of the shop, the furniture of the offices, the grounds, buildings, etc., in short everything belonging to the work of the licensee, the city of Paris will buy them all for the valuation of experts at the time of the sale.

This sum shall be paid to the licensee within six months after the sale. The amount of the buying in shall be paid on condition that the licensee shall surrogate the city to all his rights and privileges, leases, rents, promises of sale, etc. This transfer shall in no way or measure result in associating the city in law

suits or other litigious difficulties which may exist at the time of sale between the licensee and any third party. In view of this clause it is forbidden to the licensee to transfer or mortgage for the benefit of anyone, the buildings used by the company or the works under the public roads or in private property. The property of the licensee not used for the work which makes the object of the present permit, shall be excepted from this clause.

ARTICLE 22.

At the time fixed for the expiration of the present franchise, the conduit shall be the property of the city unless the city prefers that they shall be removed, and, in that case, the site shall be put in its original condition at the expense of the licensee, either by himself or the authorities, without his having the right to indemnify.

It shall be the same in case of the cancellation of the franchise either for the whole or part of the system.

ARTICLE 23.

The licensee shall be wholly responsible, as well to the city as to third parties, for any damages which shall be the consequence of the constructing, the presence, or the working of the electric system.

Besides, the licensee can not demand any redress of the city of Paris for injuries which his conduits or his system may suffer from accidents resulting from works in the public road and from any other cause. He reserves the right of redress from third parties, but renounces all right to appeal for guaranty to the city of Paris.

ARTICLE 24.

The licensee shall, as guaranty of the obligations above mentioned, and as guaranty of execution, give to the municipal treasury security of ———.

This security shall be paid to the city of Paris if the licensee does not comply with the provisions of the specifications, especially those indicated in Nos. 2 and 3 of twentieth article of the present book of specifications.

The securities can not be given except in 3 per cent French of quotations Government bonds or in bonds of the city of Paris, payable to the bearer at the rate existing at the date of deposit. The licensee may receive the arrears.

ARTICLE 25.

The proportional number of foreign workmen employed by the licensee may not exceed one-tenth.

The length of the working day shall be nine hours.

The working hour of the electrical and mechanical workman shall be paid at a minimum of 0.80 francs from 6 o'clock in the morning to 6 o'clock in the evening, 1.20 francs from 6 o'clock in the evening till midnight, 1.60 francs from midnight till 6 o'clock in the morning.

These minimum prices shall be revised every five years and shall vary in the same proportion as the average salary entered in the pay roll of the city of Paris.

For work provided for in the pay roll of the city of Paris, the wages shall be in proportion to those entered in the pay roll.

Work by contract is forbidden.

The licensees shall be obliged to insure the workmen which they employ against accidents without deducting from their wages.

All the necessary precautions for the safety of the workmen and of the public shall be taken as ordered by the administration.

ARTICLE 26.

Any noncompliance with the clauses of the specifications, any violation of the regulations in force or of the directions published by the administration within the limits of the rights which these specifications confer, shall result in the imposing of a fine of 50 francs for each infringement and each day of delay, until compliance with the requirements without prejudice to the application of the clauses relating to the cancellation of the franchise.

The amount of these fines, also the cost of the enforcement of duty shall be deducted from the amount of the security, which deficiency must be made good in the maximum time of a month after such deduction.

In case of insufficient security of failure to make good the deficiency sum of security, the administration shall have the right to seize the proc the system of the licensee until due compliance.

These resolutions are equally applicable when the licensee shall not pay municipal treasury, in the fixed term, the rent he owes the city in acco with these specifications.

ARTICLE 27.

All the material, including the electric wires and the incandescent lamp be furnished by French houses and be manufactured in France.

ARTICLE 28.

The licensee must, at his responsibility, make application at the right t all permits necessary besides those of the municipal administration of Pa

ARTICLE 29.

The licensee must elect domicile in Paris. (That is, must either himself there or have some legal representative there residing.)

ARTICLE 30.

The cost of stamp duties, of registration, printing, and of everything to the present franchise shall give rise shall be at the expense of the licensee

It shall be the same with all taxes and contributions of whatever nature the present franchise involves.

These specicfiations adopted by resolve of the municipal council Decem 1888.

NEW YORK.

THE PRACTICAL WORKING OF THE ELECTRICAL SUBWAY NEW YORK CITY.

[Extracts from a paper read before the forty-third meeting of the American Institute trical Engineers, New York, February 18, 1890, by William Maver, jr., electrician of Ne Subway Company.]

In preparing this paper I have found that the subject has almost natura ranged itself under the following general headings, namely:

The type of conduits used in the sub-ways.	Joints.
	Lead-covered cables.
The drawing in of cables.	Insulation and tests.
The methods of distribution.	Alleged dangers of the subways.
The cables employed in the subways.	Gas in the subways.
Present condition and probable duration of cables.	General remarks.

I have been unable to obtain with any degree of accuracy the extents o trical subways or the amount of wire placed in them in the cities of Euro therefore I can not say definitely how New York to-day compares with cities as London, Paris, and Berlin in that respect. But I incline to the that it may be found that New York will fall but little, if at all, behind cities. In New York City to-day there are 73 miles of electrical subwa 1,017 miles of ducts. In these ducts there are 10,906 miles of telephone 945 miles of telegraph wire (including fire-alarm telegraph wires), and 457 of electric-light wires. These subways have a capacity for about 45,000 m telephone and telegraph wires and 2,000 miles of electric-light wires.

CONDUITS.

There are in the New York electrical subways eight different conduit sy namely: the Dorsett, the Wyckoff, zinc tubing in hydraulic cement, she cement-lined pipe, wrought-iron pipe in hydraulic cement, wrought-iron p

asphalted concrete, the Edison iron tube, and the Johnstone sectional cast-iron conduits. All of these conduits have been frequently described; I shall, therefore, just briefly refer to each.

The Dorsett system consists of blocks formed of a material the ingredients of which are pitch, coal tar, and fine gravel. The blocks are molded, with tubular openings about 2¼ inches in diameter from end to end. The blocks are about 4 feet long and 1 foot cross section. The blocks are placed end to end in the trench, and are joined together by pouring between the ends a liquid compound of pitch and tar, which speedily hardens. This compound is prevented from entering the ducts by sleeves which are placed in each duct between the junction of every two blocks. There is about 1 mile of this conduit, containing 16 miles of ducts, on Sixth avenue. It is used for telephone and telegraph conductors. This conduit was laid three years ago. So far as I can learn it is in a fair state of preservation to-day, but not perfect, the block shaving in some instances sunk and thus put the ducts out of alignment. It may be noted here that one-quarter inch tarred hemp, guide ropes of which were laid in these ducts when this system was constructed, to be in readiness when cables were to be drawn in, show plainly in numerous places signs of deterioration, said to be the result of dry rot combined with the gases found in the ducts.

The zinc tube conduits are laid in Fifty-eighth street. The zinc tubing was intended to serve simply as a mold around which hydraulic cement concrete was to be placed, with the expectation that when the zinc had corroded, the tube formed by the solid cement would remain intact. About 1 mile of this conduit has been in successful operation for three years, but the difficulty attending the construction of a conduit formed in this way was so great, owing to the frailty of the zinc tube, which readily gave way under moderate pressure, that its use has not been further extended.

The sheet iron cement-lined pipe conduits are made in single or multiple tubes of two, four, six or more ducts, as may be required, and in length of 8 feet. The tubes are connected together by a ball and socket joint. These conduits are made as follows: A sheet iron tube 8 feet in length is held vertically; inside of the tube is placed a smaller brass tube; semi-liquid cement is poured into the annular space between the brass and sheet-iron tubes. When the cement has solidified the brass tube is withdrawn. The cement is then ready for the subways. There are about 113 miles of ducts of this conduit in the subways, and during the coming summer it is expected many times this amount will be laid in New York City.

There are about 15 miles of creosoted wood ducts in the subways, known as the Wyckoff conduits. These ducts are formed of wood piping similar to ordinary pump logs. There are lead-covered telephone cables in these ducts, and the action of the creosote upon the lead covering is being carefully watched. These ducts have been in operation for three years. I am informed that detrimental effects are noticeable in the lead covering of the cables, which is alloyed with 3 per cent of tin.

The bulk of the subway conduits consists of wrought-iron pipe laid in hydraulic cement concrete. These pipes are 20 feet in length and vary in diameter from 2 to 3 inches. The thickness of the iron is 0.217 inch.

In laying all of these pipe conduits the bottom of the trench is first leveled to grade; planks are then sent against the side of the trench to sustain it. A layer of concrete is then laid and rammed in the bottom of the trench. On this is placed a row of iron pipe, next a layer of concrete, then another row of pipe, and so on, until the desired number of layers is attained. The number of pipes in a row depends upon the topography of the street and the location of existing gas and water pipes, which it is desired to avoid; and the number of rows upon the total number of pipes desired to be laid in a given subway. In order to add strength to the mass and to protect the ducts from mechanical injury, the concrete is applied more thickly on the bottom, top, and sides of the subway than between the pipes. There is placed over all a 2-inch yellow pine planking, heavily creosoted, to further protect the conduits against injury from picks, crowbars, etc., in the event of further excavations in the streets.

The wrought-iron pipes are joined end to end by a coupling screw joint with a tapering or vanishing thread. By the use of this form of thread, I am informed, the rate of laying this piping is increased 50 per cent. These tubes are delivered free from burrs, and have a smooth inner surface. The pipes are sometimes asphalted to prevent rusting, but should they in course of time rust, it is expected, as in the case of the zinc tube, that the concrete will preserve the shape of the duct intact. There are close upon 550 miles of wrought-iron piping in the subways.

The facility with which a pipe conduit conforms to the varying condition of the crowded streets of large cities, as found in the process of trenching, is one of its chief advantages.

The main reasons which have led to the extensive use of wrought-iron piping in the subways are its great strength, its adaptability to varying conditions of the street, and the rapidity with which it can be laid.

The Edison system consists of wrought-iron pipe in which are placed the copper conductors or rods. These conductors are wound with rope and the pipe is filled with an insulating compound of Trinidad asphaltum, rosin, paraffine, and linseed oil. These iron pipes are laid directly in the earth. There are about 50 miles of this pipe now laid in New York City.

The subways are in many cases on both sides of a street, and as a rule the telegraph and telephone wires are assigned to ducts on one side of the street and the electric-light wires to ducts an the opposite side; but in numerous instances the electric-light wires are operated in distributing ducts on the same side of the street as the telephone and telegraph wires, and without detriment to the latter.

MANHOLES.

Access is had to the conduits of the New York subways by means of manholes placed at an average distance of about one twenty-fifth of a mile apart. The manholes are, with a few exceptions, built of brick laid up in concrete cement, with hydraulic concrete bottom. The outside of the walls is coated with cement to prevent moisture and gas from penetrating.

Access to the manholes from the street is had through the cast-iron head which is set on the brick work, and which is provided with double covers. The upper or street cover weighs about 350; the lower cover is provided with a rubber gasket to prevent ingress of street water into the manhole. This cover is funnel-shaped in order that any water which may enter through the upper cover may be drained away from the gasket. The lower cover is screwed down upon the gasket by a gun metal bolt and crossbar. The uper cover is loose upon its bearings. The ducts enter the manholes at a point easily accessible to the workmen while standing on the bottom of the manhole. The average width of the manholes is about 5 feet, and varies from 5 to 10 feet in depth. The hand blower used for driving out gas from the manholes is shown, also the iron framework or cage which is placed around the opening to the manholes when the cover is removed.

The foregoing mentioned conduits may be considered as belonging to the regular subway system of New York City.

There are, however, several other conduits in operation in this city, namely, the Brooks, the Western Union, and about 5 miles of telephone cable laid in wooden boxes filled with sand. The Brooks system has been so repeatedly described I need not further allude to it. The Western Union subway consists of an iron pipe about 6 inches in diameter, into which wires have been drawn.

RODDING.

The electrical subways of New York City, with the exception of the Edison system, are of the class known as the drawing in and out systems. The first process in drawing a cable through a duct which is not easily accessible, except at its ends in the manholes, is obviously to provide a means of drawing in the cable. This is done by a process technically termed rodding, which consists of pushing rods through the ducts from one manhole to the next. A rope is then attached to the end of the rod, and the rod is withdrawn, bringing the rope with it. This rope is then employed to haul in the cable. As some of the manholes are over 500 feet apart, and it would not be convenient to procure a continuous wooden rod of that length—rods of about 4 feet in length, furnished at one end with a screw and at the other end with a screw socket, are used. These are placed in a bunch in a manhole, and are attached by the screws, one to the other, as many as are required to the distant end of the duct. The rods are then detached as they are drawn out by unscrewing the ends. This is a specimen of this form of rod [showing]. It is the one most generally used. There are other forms of rods also in use in the subways. This [showing] is one of them. It is furnished with a slot, into which the T-end fits, but into or out of which it can only go at a certain limited angle. Therefore, while this joint of connection is quite loose, there

is no likelihood of the rods coming apart in the duct, because the diameter of the ducts does not permit a sufficient movement of the rod at the joints. The time taken in rodding a duct of 300 feet in length is about twenty minutes.

Continuous steel wire rods about one-quarter of an inch thick and from 300 to 500 feet long are also used for rodding the ducts. These rods are mounted on a reel about 6 feet in diameter which is placed adjacent to a manhole and from which it is reeled off as the rod is pushed through the duct. When this operates freely, it is more expeditious than the wooden rod methods just prescribed, as the time taken in jointing up the rods is saved; but it is found that the wire occasionally buckles in the duct and furthermore it is more apt to be caught by any obstruction or unevenness than are the wooden rods, so that by many the latter are employed as being the more expeditious, all things considered.

There is also another method of rodding sometimes employed, which consists of a long spiral steel rod, the spiral of which is about 1 inch in diameter. On the circumference of the spiral small wheels are mounted to ease the friction. This rod is also placed on a reel and wound off as it is fed into the duct. This spiral while quite elastic is yet capable of withstanding considerable pressure. This rod is pushed into the duct in the usual way. The expense and the weight of this form of "rod" is somewhat against it, although I am informed that by its use a duct can be rodded in one-half the time required by the screw rods.

Sometimes in rodding obstructions are met with caused by pieces of cement, stone, dirt, etc., gaining access to the ducts. Sometimes, also, obstructions are caused by uneven joints in the conduits. Ordinary obstructions are removed by a mandril placed on the first rod.

DRAWING-IN CABLES.

After the rope has been attached to the cable, the latter is then "threaded" through the duct. The attaching of the rope to a cable is a matter of some skill. The connection is so made that the strain comes chiefly on the conductors. To prevent the cable or cables from twisting as drawn in, a swivel is inserted in the rope near the cable.

The manner of applying the force necessary to pull the cable through the duct depends upon the size and length of the cable. If it is a small cable, say 300 feet in length, it can be drawn in by two or three men. If it is a large, or if four or six small cables are to be drawn into one duct, as is frequently done, more elaborate drawing-in apparatus is used. This generally consists of some form of winch. The largest telephone cables are drawn in by a winch of special construction, in which the power is transmitted through the intervention of wheel gearing. As a rule, it may be said that in the matter of drawing cables into the ducts the work has been satisfactorily performed. In a few instances mistakes have been made, as in the attempt to draw too many cables into one duct, the old problem of putting a 3-inch bung into a 2-inch hole, and in the attempt several lengths of cable have been jammed in the ducts and injured.

As many as six electric-light cables, No. 4 B and S. conductors, have been repeatedly drawn at once into a 3-inch duct. It is not deemed advisable to draw cables into or out of ducts over cables already laid, but in cases of necessity it has been done without injury to the cables.

As the weight of a No. 4 B. and S. lead-covered cable is for 300 feet, say 250 pounds, an idea may be obtained of the force required to draw in such cables. I am informed that cables weighing in the aggregate 5,510 pounds have been drawn at one time into one duct.

METHODS OF DISTRIBUTION.

It is, of course, a comparatively easy problem to arrange an electrical subway for trunk-line circuits. The difficulty arises when the question of distribution of the current from the main conduits is to be considered, as when, in the case of the telegraph and telephone circuits, it is desired to furnish city customers with circuits, and in the case of electric-light service when it is required to make house-to-house or street-lamp connections.

In the case of telegraph and telephone distribution subsidiary pipes or ducts are generally led from adjacent manhole to the front or side of building whence the cables are continued to the roof of the building or to the back yard, from which latter points the circuits are radiated as required.

The cable of the telephone company is generally made up into fifty pairs. When this number of circuits is not required in one block or series of blocks the

cable is forked in the manhole, one portion of the conductors being led in smaller cable in one direction, another portion elsewhere, as may be require This method of distribution has been found convenient and satisfactory.

Distribution of the electric-light current is effected in several different wa in the New York subways. For street arc lamps the circuit is usually loop from the manhole to the lamp-post through a subsidiary iron pipe.

For easy access to houses and to lamps in the middle of blocks, distributi ducts are laid above the trunk ducts as near the surface of the street as pra ticable, the average distance from the surface of the street being, perhaps, inches.

The Johnstone sectional conduit has hitherto been the most extensively e ployed for this purpose in New York City. This conduit consists of sections cast-iron ducts about 5 feet in length. The sections are placed directly abo each other and are held together when in position by removable clamp pie The upper section rests in a groove in the lower section. Each section of t conduit is divided into two to six or more compartments or ducts—depending up the size of the section—the ducts being formed by removable partitions or sla held in position by suitable channels or grooves within the sections. Opposi each house or every alternate house a handhole is provided in the upper se tion of the conduit. This handhole consists of a removable cover, about 2 fe in length, on the upper section, and the side of the section at this point is pr vided with a branch or spigot.

This conduit is laid directly in the earth, not in cement. When it is desir to obtain access to a conductor to tap or loop a circuit into a building, the pa ing and earth are removed from the street and the cover of the handhole lifted, thus exposing the conductors in the ducts. A 3-inch iron pipe is r from the branch at the handhole to the basement or vault of the house or to lamp-post with which connection is desired to be made. This iron pipe fits t spigot at the side of the conduit. The connection is then made with the co ductors by splicing on short lengths of cable leading through the iron pipe to t house or lamp. Should the conductor which it is desired to tap be at the si of the section remote from the spigot, the intermediate partitions are remov to permit the passage crosswise of the connecting cable. After the joints a made, the cover of the handhole is replaced and the earth and paving are r stored to their normal condition.

When a handhole has not been provided originally at a point where access desired to a conductor in the conduit, the entire upper section is removed and r placed by a half-section containing a handhole cover and spigot. This wo can be done in a short time. The sections in use for this purpose are in some i stances somewhat small for ease in joint-making, especially as but very litt slack is available when T joints are to be made, and, therefore, in future larg handholes will be provided. These conduits are presumably made air a water tight at the junction of the two sections, and at the ends of the ducts, by t use of plumber's putty. In view of the number of supposed opportunities f the entrance of moisture at these junctions it would be naturally expected th this type of conduit would be in a chronic moist condition. Indeed it has be predicted of it that the ducts would act as canals for the surface water, but, as matter of fact, these ducts are almost invariably dry. There are two theori given to explain this fact. The first, that in reality the plumber's putty mak an air and water tight joint; the second, that if the joints are so imperfect as admit water, they are quite capable of permitting its escape also. It must said that this conduit has been found of much utility in the practical distrib tion of electric light current in this city.

More recently a method of distribution in which wrought-iron pipes are us has been employed. This consists of a row of three or four iron pipes laid, lik the Johnstone conduit, as near the surface as possible, in the earth, without co crete. Opposite every party wall, or, in other words, at a distance of about feet apart, iron boxes, about 18 inches square are placed. These boxes ha removable covers. The ducts enter at the ends of the box but do not pass throu it. The boxes are provided with sides opening also for the entrance of the su sidiary iron pipes. Access is had to these boxes also by the removal of t street paving and earth.

This method of distribution has, like the one just described, been found sati factory. Certain mechanical improvements in the construction of both are, ho ever, desirable, and are contemplated.

When it is desired to cross a street to reach customers subsidiary ducts a constructed.

It is frequently remarked (presumably derogatory of the existing electrical subways) that no system of house-to-house distribution can be considered perfect which requires the tearing up of any portion of the street to obtain access to the mains. This will be granted by anyone. The same is equally true of the house-to-house distribution of gas and water from the street mains. In all of these cases if the connections were made from the street mains to every house and vacant lot along their routes when the mains are first laid the necessity for re-opening the streets to make house connections would be avoided. But I have yet to learn that this is done by either the gas or water companies, nor have I heard that their neglect to do so has been seriously animadverted upon.

It would, therefore, seem unreasonable that the additional expense of making these connections, which may never be required, should be urged upon the users of the subways by any one who has the interests of electrical industries at heart, especially while they ignore the failure of the gas and water companies to make corresponding connections.

THE CABLES AND INSULATION USED IN THE SUBWAYS.

In the telephone service in this city the cables used are chiefly of the type known as the Patterson. This cable is constructed as follows: Ordinary cotton covering is first placed around the wires. After the wires are cabled a lead covering is placed over them and paraffine is then forced into the interstices between the conductors and lead covering.

This cable has an electrostatic capacity of about 16 microfarad. The insulation resistance of the cable laid and jointed in the subways averages about 100 megohms. The longest stretch of cable used by the telephone company in the subways is 7 miles. The greatest number of conductors in any one cable is one hundred, or fifty pairs.

The telephone service in the underground conduits was impaired somewhat, so long as ground circuits were used, but since the adoption of metallic circuits the service is satisfactory. On the long-distance telephone circuits the 7 miles of cable is, of course, somewhat detrimental.

The telegraph companies have thus far used chiefly for underground service kerite, okonite, Standard underground, and Patterson cables. The kerite and okonite insulation, it is well known, are homogeneous compounds. These cables are not lead-covered. Of course they could be. The Standard and Patterson are fibrous cables and are lead-covered.

Except in the vicinity of the underground steam pipes, the unprotected homogeneous cables have given uniform satisfaction. But, as might be expected, the effect of escaping steam upon them has been detrimental.

Fortunately, the heated area in the vicinity of the electrical subways is limited to a portion of the downtown districts. Investigation has shown that the heat only reaches a harmful temperature in the neighborhood of actual leaks in the steam pipes. Measurements of the temperature of a manhole in the worst section of the heated district have shown as high as 150° to 200° F. Since the starting of the blowers in this district to ventilate the subways a noticeable decrease in the temperature is observable, and, inasmuch as the steam-heating company is achieving some success in its efforts to close up all leaks in the pipes, it is anticipated that the heat difficulty will be eventually removed from the subways.

The users of the Standard and Patterson cables state that those cables are giving very fair service in the heated portions of the subways, although the high temperature, of course, lowers the insulating resistance of the cables.

The average number of conductors in the telegraph underground cables is about fifty. The size of the wire used is, as a rule, No. 16, B. W. G., and the outside diameter of a conductor, including the insulation, is 6 to 30. The insulation resistance of the okonite insulation is about 2,500 megohms; that of kerite 500 to 800 megohms, and that of the Standard and Patterson about 1,500 megohms per mile for the thickness of insulation just mentioned.

Outside of the injury to the cables due to the presence of the steam heating pipes, no undue deterioration of the telegraph cables in the subways has been noted.

The effect of the increased electrostatic capacity of the underground circuits has not caused any marked inconvenience in the operation of the telegraph circuits.

The comparatively low mileage of telegraph wire in the subways is partly explained by the fact that the bulk of the telegraph circuits in New York City are

suspended from the elevated railroad structures. The fire-alarm telegraph cables in the subways do not differ very materially from those used by other telegraph companies. The fire department thus far has used Standard underground cables.

ELECTRIC-LIGHT CABLES IN SUBWAYS.

In the electric-light service in the subways—and I am aware that it is around this that the greatest interest centers—there are, exclusive of the Edison system, four different types of insulation used, namely, the Bishop rubber compound, the Standard underground, the Safety insulated, and the Cobb vulcanite paraffine cable. All of these cables are lead-covered as a precaution against mechanical injury, action of acids, etc., or moisture.

The sizes of conductors used in the electric-light service vary with every company and with the character of the service. For feeders, the conductors range in size from No. 6 noughts B. and S. to No. 2 B and S. For mains, from No. to No. 6 B. and S. In many instances No. 10 B. and S. is used for connecting from the mains to the lamps through the subsidiary ducts.

THE STANDARD UNDERGROUND CABLE.

The insulation of the standard underground cable is obtained by first wrapping thick cotton thread or cord around the wire to any desired thickness. The wire just covered is then placed in a caldron of boiling insulating compound—a product of petroleum. This treatment displaces any moisture that may be in the cotton thread. After the cotton has been thoroughly saturated with the compound the whole is then lead covered. Care is, of course, taken by soldering up the ends of the cable to prevent absorption of moisture in shipment and in drawing into the ducts.

There are now in actual service for electric-lighting purposes in the New York subways over 95 miles of this cable, carrying currents of an E. M. F. of from 30 to 3,000 volts, including many 1,000 volts alternating currents, and an additional 50 miles of the same cable will shortly be in operation. The thickness of insulation used in these cables is five thirty-seconds, six thirty-seconds and seven thirty-seconds of an inch. This refers to the thickness of the insulation from any given point of the circumference of the conductors.

THE "SAFETY" CABLE.

The insulating material of the "safety" cable is an India-rubber compound. It differs somewhat, I believe, from the ordinary run of India-rubber compound cables in that the compound is placed over the wire, without seams or laps of any kind. This compound is vulcanized to a moderate degree of hardness sufficient to prevent the centering of the heavy conductors which it insulates, but yet it retains a high degree of flexibility.

The thickness of insulation used in No. 4 B. and S. wire, 0.204 inch diameter is 0.108 inch. The weight of this conductor, lead covered, is 4,861 pounds per mile. Of this the wire weight 665 pounds, the insulation 669 pounds, the tape 95 pounds, the lead covering 3,432 pounds.

A special thickness of this insulation was made in one instance in response to a call for cable to withstand a strain of 7,000 volts for arc lighting. A sample of this cable is on the table; the thickness of the insulation is 0.238 inch. The conductor is No. 4 B. and S. gauge. This cable is now in the subways. Its length is about 3 miles. I am not aware that it has yet been called upon to withstand the prescribed 7,000 volts.

There are now over 65 miles of the "safety" cable in actual use in the subways assigned to electric-light circuits carrying continuous and alternating currents of from 1,000 to 2,500 volts E. M. F., and about 15 miles additional are now being placed in subways.

THE BISHOP RUBBER COMPOUND CABLE.

The Bishop rubber compound cable is of the well-known Silvertown type, having first a coat of rubber without sulphur, then a coat of rubber compound with sulphur, and over this a lapping of rubber cable which is then taped. There are two sizes of this cable in the subways, namely, No. 4 B. and S. and No. 6 B. and S. The thickness of the insulation is four thirty-seconds of an inch; th

thickness of the lead covering is five sixty-fourths of an inch; the outside diameter of the cable is 0.65 of an inch; and the weight of the cable is about 3,432 pounds per mile. There are of this cable in successful operation about 10 miles assigned to alternating currents of 1,000 volts, and 5 miles to arc circuits of 2,500 to 3,000 volts E. M. F. Double this amount of this cable will soon be laid for similar purposes.

THE "COBB" CABLE.

The Cobb vulcanite-paraffine cable is of a somewhat unique construction and design. It also differs, materially in one respect, from the other cables described, in that the conductor is freely movable within its insulating medium. The cable is made in practically the following manner: A vulcanite tube is first made in lengths of about 300 feet. This tube is moderately flexible. The tubing is vulcanized in boiling paraffine. The wire is then threaded through the tube, after which the sections of tubing are joined together. A thick cord is then wound spirally around the vulcanite tube. The whole is then lead covered, and the space between the vulcanite and lead formed by the spirally wound cord is filled with paraffine.

There are about 25 miles of this cable in the subways.

In the case of the Bishop, Safety, Cobb, and Patterson cables, the lead is alloyed with about 3 per cent of tin. The lead covering of the standard underground cable is unalloyed, but it is covered with a thick cotton braiding soaked in "P. and B." paint (the latter a product of petroleum), which it is claimed will protect lead from acid gases, etc., and the braid also acts to protect the lead from mechanical injury.

CONDITION OF THE CABLES.

I may say that all these cables are guarantied by the manufacturers for three years. This term, however, is not to be taken as signifying the limit placed upon the life of the cables by the manufacturers.

It is over a year since current was turned on the first high-tension electric-light circuit in the New York subways. This was a circuit in One hundred and twenty-fifth street, belonging to the Harlem Electric Light Company. The insulation resistance of the cable, as measured just before the turning on of the current, showed it to be 1,750 megohms per mile. A test made of the same circuit last week, after one year's continuous service, showed it to have an insulation resistance of 1,516 megohms per mile. Since the installation of the circuit just referred to, electric-light cables of the various types described, have been drawn into the subways almost as rapidly as they could be manufactured, and tests made of the conductors, months after the initial test, have shown them to be in the same electrical condition as when first laid.

There have been several burn-outs in cables in the subways within the year, but with the exception of an abandoned cable, to which I shall refer later, these burn-outs have been traceable in every case to defective joints or to mechanical injury. In all, according to the records, and best obtainable information, there have been, exclusive of those in the abandoned cables, but five burn-outs, in over 185 miles of electric-light wire during the period of active service of the conductors, ranging from one to thirteen months.

In the case of twenty-seven out of thirty-four of the electric-light circuits in the subways not a single defect of any kind has occurred since they were placed in the ducts.

There have been several instances when faults not amounting to burn-outs have been discovered by the regular tests, which have brought the insulation resistance of certain conductors below the requirements of the rules of the subway, but these defects have generally been located and removed without serious delay to the circuits. Where this has not been the case it can be fairly attributed to the employment of untried insulation, unfamiliarity with underground service, or to the inexperience of the men to whom the work of connecting up circuits, etc., has been intrusted. For example, in a number of cases grounds have been traced to contact of the conductor with the lead covering, and the linemen so connecting them have explained that they were not aware the lead covering would cause a ground.

On several occasions grounds have been caused by the driving of nails through the lead covering of the cables or leading-in wires, under the molding inside of buildings, and again a ground was caused by a laborer's pickax while excavat-

ing for a new subway which crossed an existing subway. It is related of the laborer that when he saw the smoke arising from the burning insulation he first tried to put out the fire by throwing water over the cable, and subsequently by throwing wet mortar around it.

LOCATING FAULTS.

The method employed for locating faults in electric-light conductors in the subways is to test the conductor from point to point until the defect is placed between two lamps, or manholes. When a fault is located between two lamps or two manholes—if it is in the cable proper and not in a joint at a handhole or box—the defective section is withdrawn and a perfect section put in its place. With the exception of the hard, rubber cable referred to this has, I believe, been necessary but on three occasions after the current has been turned on the circuit; in two of these the defects were caused by improperly made joints; in the other case by a mechanical injury.

In the case of the arc light or series circuits, defects in the cables are more readily located than in multiple arc circuits, because of the facility afforded by the openings at the lamps for testing the conductor in sections. In the case of multiple arc circuits there is at present no means of locating faults but by cutting the conductor in manholes. For, as the house connections are made from the cable by T joints, it is obvious that the only effect of disconnecting the lamps or converters from the cable is to separate the two conductors of the circuit. These remarks, it is understood, do not apply to the Edison conductors, to which, it is well known, access is had at the ends of each pipe, by removing the paving and earth above the pipe.

No attempt is made to locate faults in electric-light circuits in the subways by electrical measurements, for the reason that the obstacles in the way of obtaining accurate data are so numerous that it has not been considered expedient to rely on the results of such measurements. For instance, the uncertainty as to the distribution of the resistance of the conductor, owing to the numerous joints in the circuit, the variations in temperature of the subways, and the difficulty in ascertaining it, etc.

To facilitate the locating of faults, should they occur in the subways, several forms of accessible joints have been suggested for use in the manholes. One of these, known, I think, as the Dillon joint, consists of a metal cup, having in its bottom apertures through which the cable ends pass. The lead covering of the cable is soldered into the cup, the conductors are connected or spliced and insulated when a water-tight cover is screwed over the cup.

Another accessible joint, known as the Cobb joint, is made as follows: A copper disk is soldered on the ends of the conductors to be connected. Over the disks a vulcanite sleeve is placed. Two shoulders having respectively a right and a left hand screw, are placed, near the sleeve, over the insulation of the conductor. The sleeve is provided with a right and a left hand thread. The forward movement of the shoulder is checked by the disk on the ends of the conductors. Thus when the sleeve is screwed on to both shoulders the tendency is to press the two disks together tightly. This joint can be made quickly, but as to its practical utility it is not possible to speak definitely as yet, since it has not been in actual service in the subways so far as I am aware. The same is true of the Dillon joint.

It is, perhaps, a debatable question whether easily accessible joints are desirable in the manholes of subways, as the tendency in such cases might be to lead to accidents by the exposure of live wires.

DURABILITY OF CABLES.

Concerning the much discussed question as to the relative durability of rubber compound and fibrous cables, I do not think sufficient time has elapsed in the case of the cables in the New York subways to enable one to arrive at a definite judgment. In the case of both types of cable, as I have already said, many circuits have been running continuously for over nine months, and in some instances for over one year, without a defect of any kind, electrical or mechanical, having occurred, and the slighter defects that have occurred on other circuits have as yet been so few in either type of cable as not to certainly show any marked superiority of one type over another. Specimens of cable that have been examined after nine to twelve months' service show no physical or electrical signs of deterioration of the insulation.

As regards the question as to which kind of cable will best withstand the heat from steam pipes adjacent to the subways it would appear thus far that the lead-covered fibrous cable is superior to the homogeneous cable not lead covered. Lead-covered rubber compound cables have not as yet been tried in the heated districts.

MULTIPLE CABLES.

There are no concentric cables in the subways in this city. The mains of multiple arc circuits are operated in separate lead covers in the same duct. It is contemplated, I believe, by some of the companies to use one lead cover for such circuits hereafter. One objection on the part of the companies to the use of concentric cables is the anticipated difficulty in making joints, especially where frequent connections for distribution are required. This objection should not hold good in the case of the feeder portion of the circuits.

As to the use of multiple cables for electric lighting. One such cable—a fibrous cable—having eight conductors under one lead cover was placed in the subways, but has not been operated as yet, trouble having been found in making perfect joints. I have no doubt that with the experience since had in joint making, this difficulty would be overcome; but it seems to be the general opinion that the use of multiple cables is not advisable in electric lighting.

On the subject of loss due to increased electrostatic capacity or to increased self-induction of conductors in the subways, I may say that I have made careful inquiry of superintendents of stations where the alternating current is used, and learn that no perceptible difference in the operation of the circuits as compared with similar circuits overhead is noticeable. I have been informed that in wet, stormy weather a decided improvement is observable—in fact, that the condition of the weather does not affect the circuits. This will be readily understood when it is stated that a recent test, made during the prevalence of a drenching rain storm, of an arc curcuit in the subways 4 miles in length, showed an insulation resistance of 2,400 megohms per mile. The lamp connections were disconnected from the cable proper during the tests, so that the entire cable was under cover except at the pole.

JOINTS.

When it was being urged upon the electric-light companies of this city that they were not using due diligence in placing their wires underground, the companies retorted that they were doing so as rapidly as it was possible, consistent with good workmanship, and stated that it was not possible to joint up the cables more rapidly than was being done with the number of cable-jointers at their command. To this an official of the city replied that this did not, in his opinion, constitute a valid excuse while so many poor men were idle who would be only too glad to be given work at jointing the cables.

This was the view of a layman, but it would seem that in a number of instances in the electric-light service in this country a similar view, namely, that anyone could make joints, and that any kind of joints might be made, was held by those who should be supposed to know to the contrary.

In this city, I think, it is now fully recognized, by the electric-light companies at least, that it pays to employ good jointers in underground work.

Several forms of joints are used on the electric-light cables in subways, among them one known as the rubber joint. It is sometimes termed the half marine joint. This joint is made practically as follows: First, the lead covering is removed for about 3 inches from the end of the conductor. About 1 inch of the insultation is then removed from the ends of the conductor; the ends of the conductor are then "sweatted" together, generally a split copper sleeve being placed over the ends. When a T joint is to be made, a T sleeve is used. This facilitates the making of the joint by dispensing with filing the ends of the conductor and then wrapping them with small wire. No acid is used in the making of the joint. Resin is commonly used as a slag.

After the wire has been spliced, the insulation is then scarfed for about three-quarters of an inch, when a layer of pure rubber strip is wrapped around the wire spirally back and forth about three times, and each time the rubber is brought further up the scarfed insulation. A few layers of white rubber strip is then wound above the pure rubber strip and after that a layer or two of pink rubber strip. A layer of fibrous rubber tape is then put on over all. Between each layer of rubber strip a small quantity of rubber solution is put on to make the rubber adhesive and practically homogeneous. A lead sleeve is then placed

over the joint and wiped on to the lead covering. This joint can be made in about twenty minutes, exclusive of time taken in wiping the lead sleeve. This joint is used altogether on the "Bishop" and the "safety" cables. Also, occasionally on the Standard and the Cobb cables. But as a rule the Cobb people make a special joint somewhat as follows: The ends of the conductors are spliced in the usual way, a hard rubber ferule having first been placed over one end of the conductor and a brass ferule over the other conductor, above the insulation. A machine like a double vice is then placed over the lead covering of the cable and made fast thereto. A tightening devise next draws the ends of the vulcanite together, taking up slack in the cable. The vulcanite sleeve or ferule is then welded by heat to the vulcanite tube, after which the brass ferule is drawn over the tube. A mold is then placed around the joint into which molten lead is poured, thus casting a solid lead sleeve. This is quickly cooled by the application to the mold of cold water. The mold is then removed and the joint is complete. This form of joint has been found satisfactory, I believe, and it is claimed that it can be made in much less time than a half marine joint.

The joint chiefly used on the Standard underground cable is made differently from either of the foregoing. After the conductor has been spliced as usual and the lead covering has been cut back from the insulation, a few turns of tape is passed around the splice. A leaden sleeve is then put on over this and wiped firmly to lead cover of the cable. When this has been done a couple of small holes are punctured in the lead sleeve through which a boiling insulating compound, used in the manufacture of the cable, is poured, filling up the sleeve completely, after which the holes are closed by solder. These joints have been found to give excellent service on this form of cable. The time taken in making this joint is about thirty minutes.

LEAD-COVERED CABLE.

The cables used in the electric light service in the New York subways are, as I have elsewhere stated, without exception lead covered. In the case of fibrous insulation, this is essential to exclude moisture, but not in the case of the rubber cables except as a protection against gas and acids, and, to a certain extent, mechanical injury. The use of this lead covering is not required by the subway rules. In addition to being a protection against the attack of acids and gases, the lead covering is considered a safeguard against accidents to men working in the manholes amongst live wires. For, if a defect should occur in the insulation in the manhole, the presence of a ground furnished by the lead covering would make the defect known at the regular test, which, if the defect were of a serious nature, would insure its being located and eliminated. Whereas if the conductor were not lead covered, there is a probability that a defect in the insulation might occur that would not be indicated by the test, but which might expose the conductor and render it impossible for workmen in the manholes to make contact therewith. It would be quite possible for a workman to handle the lead covering of even a defective conductor without injury since the lead covering is grounded throughout the length of the subway.

It will hardly be accredited by some people, but it is a fact, that live electric light wires conveying the alternating high tension arc currents are handled and moved about in the manholes by means of the lead covering without the slightest indication that such wires are live. In fact, it is quite a common occurrence to start up alternating circuits immediately after a rubber joint has been made in order to save time, and then to have the plumber adjust and wipe the sleeve on to the lead cover while the current is in full operation.

Another fact is this, that in the subways, no shocks whatever due to induced currents in the lead covering are felt by the workmen in handling the lead-covered cables conveying the alternating current. It is quite conceivable that such shocks might be noticed, as I believe they are, where the cables are suspended from point to point and insulated. In that case, any one handling the lead covering of the conductors would doubtless receive the accumulated induced charge.

It has been stated frequently tnat such induced currents, where the lead covering of the conductors is insulated, have been known to injure the lead covering and eventually to destroy the insulation.

So far as I have been able to ascertain, in not a single instance has such an action taken place in the subways.

As a matter of fact, close personal observation and careful inquiry on all sides have failed to discover thus far any sign of deterioration in the condition of the material of the conduits; the lead covering of the insulation or of the insulation

of the cables in the subways, with the exception of the effect upon the lead covering of the telephone cable in the creosoted wood conduit, referred to. I may add that even in the latter case, personal inspection and inquiry made of workmen, have not confirmed the statement that the lead covering had been attacked. At all events there is no evidence of any such wholesale manufacture of white lead as has been reported from other places where lead-covered cables have been placed in creosoted wood boxes.

INSULATION AND TESTS.

The requirements of the rules of the subway company as regards insulation are such that none but a first-class insulation can well be employed on the conductors conveying currents of high electro-motive force. These rules require an initial insulation resistance of 15 megohms per mile 100 volts electromotive force employed on the circuit, and a minimum of 5 megohms per mile per 100 volts. The initial test is made when the conductor is first laid in the subway and prior to the turning on of the current. The minimum requirement is allowed after the circuit has been in use. This insulation requirement refers to the conductor proper in the subway, and does not include the lamps, aerial connections or converters. The rule does not apply to conductors conveying currents of less than 100 volts E. M. F. In the case of alternating circuits, the uniform electromotive force employed in this city being 1,000 volts, the conductors to be employed in the service are required to show an initial insulation resistance of 150 megohms per mile, and a minimum insulation resistance afterwards of at least 50 megohms per mile.

The average E. M. F. of the arc-light circuits in the subways is about 2,000 volts, but in some instances it runs up to 3,500 volts. In the latter case the initial insulation resistance required by the rules is 525 megohms per mile. Minimum, 175 megohms per mile.

It was first thought by many that it would be impossible to maintain even the minimum insulation resistance required by the rules, and this supposed impossibility was cited by some of the electric light companies as an instance of the impracticability of the proposition that they should utilize the subways. The representative of one such company very naively stated that it would certainly be impossible for his company to maintain this insulation if compelled to go into the subways, as the insulation the company used in its service was "underwriters'." One of the experts of the same company, in his evidence, repeated the very common remark that one megohm, *if it could be maintained*, would be quite sufficient for practical purposes. I do not think that this statement will be seriously contradicted; but the difficulty is to maintain the insulation at 1 megohm in practice. Experience in the New York subways has shown that it is vastly easier to maintain the insulation resistance at 150 and even 500 megohms per mile than it has been in the past in other cities to maintain them at 1 megohm per mile. A gentleman writing of the Chicago underground system, not quite two years ago, remarked: "It was found that, although the insulation measurement of the lead-covered cables in the conduit was very high, considerably above a megohm, a short circuit would form generally within 1,000 feet of the station between the two sides of the circuit."

The explanation for this short-circuiting under such conditions would appear to be simple, namely, that if the insulation resistance of a conductor is but 1 megohm per mile, the covering being of the ordinary thickness, it is clear enough that it is decidedly inferior insulation, and if the normal insulation resistance of the conductor is very much higher than 1 megohm per mile, but the measurement nevertheless shows it to have an insulation resistance of but 1 megohm, it is or should be sufficient evidence that a fault has been developed in the insulation which need surprise no one when it produces a short circuit or burn-out.

As I was in no wise responsible for the promulgation of the subway rule which places the initial and minimum insulation resistance of the electric-light conductors at the figures given, not having been connected with the company in any capacity at the time the rule was authorized, modesty need not restrain me from saying that experience of over a year has amply proven the wisdom of those requirements; for these requirements not only necessitated the use of an insulating material possessing high specific insulation, but also compelled the exercise of the greatest care in the details of placing the conductors in the conduits, in the making of joints, etc.

When it is stated that these conductors are jointed at every manhole, and in many instances at several places between manholes, the need of such carefulness in order to maintain a high insulation will be understood.

If, for example, the method of making joints that is related was employed son years ago in Philadelphia, namely, to strip the ends of the lead covering for 2 3 inches, and then to place three or four turns of tape around the ends of the co ductor, had been followed in the New York subways, and had been permitted the absence of the rules referred to, I make no doubt I would have had to repo to-night a continued series of failures in the electric-light service similar to tho so often quoted as having happened in Philadelphia. I am confirmed in this b lief by the fact that the first electric-light conductors laid in the New York su ways were found to possess an insulation resistance of but little over 100,000 ohm This, notwithstanding that the insulation resistance of the conductors at th factory was over 2,000 meghoms per mile. There were about forty joints in the conductors. Where these had been cut out and new ones made by an expe jointer, the insulation resistance rose to over 1,500 meghoms per mile, and very recent test of the same circuit shows it to possess virtually the same insul tion resistance.

Under the methods once in vogue in other cities in this country with regard t underground work, in which no tests for defects were made excepting for suc as would be indicated by an ordinary magneto, the circuit I have referred to woul have been put into operation without question, and there is, I think, not muc doubt as to what the outcome would have been.

The high tension electric-light conductors are tested weekly for insulatio resistance. The tests are made by the direct deflection method, a Thomso reflecting galvanometer being used, and as a rule 100 cells chloride of silve battery is employed as a testing battery. The tests are generally made fro some room or basement adjacent to the terminals of the conductors in the sub way, in order that the subway portion of the circuit may be tested exclusive o aërial portions.

At present the subways do not extend to the electric-light stations, althoug in a very short time they will do so, as in the case of the Stanton street Unite States Illuminating Company's station.

When the conductors emerge from the subways they are run through subsidi ary iron pipes up the side of a pole. From this pole the lead wires are run to th testing room.

The subway conductors are, as a rule, tested exclusive of arc lamps, converte and inside wiring, but frequently also the tests are made inclusive of arc lamp and converters. These latter tests are only accepted when the results fairl indicate that the fall of insulation is due to the lamps or converters. In quite number of cases the tests with converters included show an insulation resistanc up to the requirements.

Tests of circuits are not made inclusive of house wiring because of the ge eral low results of trial tests. Some such tests that I have made showed an in sulation resistance of the house wiring of less than 1,000 ohms.

The following records of actual tests may be of interest:

Circuit A.—Arc: Initial test, 588 meghoms per mile. Last test of same circui 388 megohms. Present length of circuit, 9.5 miles.

Circuit B.—Alternating: Initial test, 141 megohms. Last test, 1,250 megohms Length, 9.6 miles. The first test was made when circuit was much shorter tha at present, and doubtless the terminals of conductor were exposed during th test.

Circuit D.—Initial test, January 6, 1889, 424 megohms per mile. Subsequen test, January 2, 1890, 484 megohms per mile. Length of circuit, 2 miles.

Circuit E.—January 4, 1889, 1,750 megohms per mile. Same circuit, Januar 4, 1890, 1,516 megohms per mile. Length, 1 mile.

Circuit F.—July 7, 1889, 264 megohms per mile. January 3, 1890, 343 megohm Length, 6.6 miles.

The readings for these tests are generally taken after one or two minutes' ele trification.

Tests with converters included, in some cases show very fair insulation. On circuit, with thirty-four converters included, showed 11 megohms insulation re sistance. Another, with eleven converters included, gave a total insulation re sistance of 159 megohms. It is not uncommon to get an insulation resistance from 2 to 5 megohms with thirty and forty converters in circuit. These tests do not include aërial portions of circuits. It should be said that the insulation of th converters and connections is being constantly improved; and, in my opinio the time is not remote when the underground circuits will test up to requiremen at all times with converters included.

As all of the conductors of the same company do not terminate at any one poin and the instruments have to be moved from place to place, the apparatus used i

making the tests is of a portable pattern. The entire outfit can in an emergency be carried by one person, and very readily by two persons.

Contrary to the expectations of some people the actual making of these electrical tests has not been attended with any serious difficulty. The most troublesome factor has been that due to surface leakage at the battery or other parts of the testing equipments during the very humid weather which prevailed so continuously last summer and winter.

The time for making these tests is, as far as possible, chosen to suit the convenience of customers. The majority of the tests are now made in the early morning. All circuits are tested once a week at least.

About 130 miles of this subway electric-light converters referred to are employed as carriers of alternate current for incandescent lighting; about 60 miles as carriers of arc light and incandescent continuous currents. The circuits vary in length from 1 to 11 miles; the longest arc-light circuit is 10 miles in length; the longest alternating circuit is 11 miles in length. In 10 miles of alternating or arc circuit there are from 450 to 500 joints. The greatest number of converters on one subway circuit is 65. There are 14 arc-light circuits and 25 alternating circuits in the subways.

Quite recently an alternating arc circuit has been installed in the subways which is intended to be the pioneer of numerous such circuits. I may say that it is ultimately intended to operate at least one hundred and twenty-five lamps in such circuits.

LIGHTNING ARRESTERS.

In the case of many of the electric-light conductors that were first laid in the subways of New York City, lightning arresters were used at street lamps and at the terminals of the cable, and in a number of instances the same apparatus is still used. These "arresters" are those known as the Acheson cable protector, and are intended to protect the cable against disruptive discharge from any source. The principle upon which the device is intended to act is that the disruptive discharges, or what would be the disruptive discharge, will jump the air space between the points of the needles, thus relieving the cable from the strain. The utility of this device for the purpose intended has yet to be demonstarted in this city, inasmuch as the frequency of burn-outs in unprotected cables in the subways has been no greater than in those which are equipped with the protector, the percentage of burn-outs on cables in either case being, as I have before intimated, very low. It is as yet, I think, an open question, whether the use of this or any equivalent device is warranted. There is no record of any of the cables in the New York subways having received injury from lightning during the past year.

It is commonly supposed that the freedom from burn-outs which the successful electric-light cables in the New York subways have enjoyed, as compared with the early experience of other cities, is due to an increased thickness of insulation around the conductor.

This may be the correct explanation; but the fact is worthy of attention in connection with this subject, that certain electrical condensers have for years been placed in positions where they are exposed to the full attack of lightning discharges on telegraph lines, without, in a single instance, having sustained injury therefrom. Similar instruments have also been placed across the poles of 1,000 volts alternating dynamo machines for days without perceptible harmful effect. Since it is difficult to imagine a better opportunity for a disruptive discharge to effect its escape to earth than that presented by the extremely thin tissue paper used in these condensers, the thought is suggested that if this paper can be so constructed as to act as a barrier to the passage of such charges there may be more to be considered in this matter of insulation than the mere question of thickness of the insulating material.

ALLEGED DANGERS OF THE SUBWAYS.

The dangers to be apprehended from the existence of the electrical subways and from the placing of the "high-tension" wires therein (according to those who are perhaps more or less inimical to that action) are varied. In general terms, they say, that the dangers which menace the public and employés from the presence of wires overhead will be multiplied manifold when the wires are underground. But when asked to specify those dangers the reply is limited to the following, namely, first, that linemen will be killed by coming in contact

with live wires in the manholes; second, that high-tension currents will lea the subways and enter buildings by way of water and gas pipes, etc.; and thir that accidents due to explosions of gas in the subways will be numerous.

As regards accidents to workmen in the manholes, due to contact with li wires, no one will say that such occurrences are impossible, but inasmuch as n a single accident of this kind has occurred in New York City, or, so far as I c learn, elsewhere, in electrical subways, it is fair to assume that, with the exerci of proper supervision of the wires, this is not likely to prove a frequent sour of accidents. I was present at the inquest of one of the unfortunate linem who was killed last year in New York City by contact with an overhead wi when a witness who had just made the statement that he apprehended mo accidents from the placing of wires underground than had occurred overhea was asked if he was aware that there were at the time about 100 miles of electr light wire underground in New York City conveying high-tension currents, a that not one accident had thus far occurred in the manhole; to which he repli that this state of things was explainable, in his opinion by the fact that t electric-light wires underground constituted but one-tenth of the electric wir of the city, and that when all the wires were underground the accidents in t subways would increase in the same proportion; which reply caused the forem of the jury to remark that the public would probably not complain of an increa of accidents from nought to ten times nought.

I have already suggested in another place that the fact of the wires beir metallically covered may have conduced to the immunity from accidents whic the workmen in the manholes have enjoyed. I may interpolate here that it recognized that the effeciency of the manholes would in many instances be i creased if they were larger, and wherever the surrounding condition of the stre will permit, it is, I believe, contemplated to enlarge the manholes.

So far as the statement is concerned that danger is to be apprehended by th entrance of powerful currents into buildings by way of water and gas pipes, b contact of a grounded conductor in the subways, it would scarcely be worthy notice before a body of electricians but for the persistency with which it is sai to be urged by men of prominence in the electrical profession. It is conceivabl that if a conductor, within a building, should by accident come in contact with well insulated gas pipe also within a building, one might receive a shock by con tact with the gas pipe if in some manner he should complete the circuit, but i what manner, in the event of a ground in the subways, any dangerous curren can be conveyed to the inside of a building by means of gas and water pipe which have the entire area of the city's foundation as a ground or a return cir cuit, is more difficult to understand.

But whatever may be the dangers, stated or unstated, so freely predicted a liable to occur with the wires underground, it may certainly be said that wit the electric wires underground men will not be injured by falling off poles on th subways. Wires, when in the subways, during the prevalence of sleet storms etc., will not fall upon people or horses in the street, nor be torn down by ele vated railway trains, street cars, etc.

GAS IN SUBWAYS.

In my opinion, the presence of gas is the most serious defect of electrical sub ways in cities; of course it is not an inherent defect in the subways, but it i nevertheless a very troublesome one, not only because of the danger of explosio therefrom, but also because of its ill-effects upon workmen employed in the sub ways.

As previously remarked, the ducts used in the subways are not only joined to gether as nearly hermetically as possible, but, except in the case of distributin ducts, they are laid in a solid body of cement from manhole to manhole. It i supposed that the gas obtains ingress to the manholes through the place wher the iron manhole cover rests upon the masonry of the manhole. But at whateve point the gas enters the subways its unwelcome presence is acknowledged, an while it is self-evident to any one who will investigate the matter for himsel and is actually admitted by the gas companies, that the gas emanates from th gas mains in the streets, nevertheless the subway engineers have been constantl at work devising means to remove the intruder.

To this end various methods for ventilating the subways have been suggeste and tried, the most successful of which thus far has been the ventilation of th subways by the use of blowers stationed at intervals along the subways, and a rangements are now in progress to place fifteen such blowers in operation cover the entire subway system.

As the ducts become filled with cables, however, the free passage of air through them is prevented, and in this way the utility of the blowers is diminished. In order to evade this difficulty a 6-inch wrought-iron pipe has been laid above the subway ducts in the more recently constructed subways. This large iron pipe has openings at each manhole. The openings are graduated as to their extent as they recede from the source of the air pressure. The large openings are at the points remote from the blower. It is intended by the use of these large pipes to furnish a counter pressure in the subways somewhat exceeding any tendency of a pressure from the outside, rather than to produce a strong current of air through the ducts, and in this way to prevent the ingress of gas through any crevices that may exist in the subways.

It has been frequently suggested that good results might follow a suction method of ventilation, but experience has shown that this would rather aggravate the evil, as it would draw into the subway all the accumulated gas in the streets besides inviting a larger leakage from the gas mains.

The only beneficial effect to the subways of this resort to blowers to drive out the gas is that the air dries up the ducts and manholes within quite a distance of the blowers.

The cause of these explosions in the subways has not in every case been definitely located. It is known that they are due primarily to the ignition of an accumulation of illuminating gas mixed with atmospheric air in explosive proportions; but the difficulty has been to ascertain by what means the gas has been ignited. It is on record that these explosions have occurred in sections of the subways in which there were at the time no wires whatever. And in cases where there have been live wires in the vicinity of an explosion, tests made immediately after the event have shown that those wires were in perfect condition as regards insulation. There are but three instances on record in which a defect in an electric-light cable has occurred simultaneously with an explosion in the subways, and in one of these cases the defect occurred so nearly incidentally with the explosion that while it is quite possible that the defect may have caused the explosion, it (the defect) may have been due to mechanical injury due to the explosion.

Among other theories it has been suggested that the gas may be ignited by currents, induced in the lead covering of alternating current conductors. This might be the case if, as I have before suggested, the cables were supported from beam to beam, as on a bridge, on insulated stands, and if the lead coverings only approached each other at intervals, but where the lead coverings of the conductors are not only grounded throughout their lengths in the subways, but are also joined metallically, in fact are practically one cable in the ducts, it seems unlikely that a quantity of induced electricity sufficient to produce a spark could be accumulated at any one point.

In the case of at least two explosions in New York City the evidence showed that the gas in the subways had been ignited by a lighted lamp or match in the vicinity of some subsidiary duct connecting with the subways. In other instances by a match or lighted cigar thrown in a manhole. It is known in Chicago an explosion was caused in the subways by a live coal from a passing fire engine falling upon the cover of a manhole.

With but one or two exceptions, the explosions have not injured the cables in the subways; which is probably due to the small and round surface which the cables present.

It has frequently been suggested that if solid ducts were employed instead of tubular ducts these explosions would be avoided. While this would be, if correct, a strong argument in favor of solid conduits, that is, ducts in which the conductors are not removable, notwithstanding the generally admitted fact that such ducts are not practicable for subway work on a large scale, experience has demonstrated that explosions have occurred repeatedly in manholes and in small junction boxes of subway systems in which there were no hollow ducts.

I may add, that pending the installation of blowers in certain of the subways, men are employed day and night opening manholes to permit escape of gas.

I had intended to comment briefly on the comparative expense of maintenance and reliability of underground wires in cities as compared with overhead wires, but as my paper has far exceeded the limits which I had placed upon it, I shall leave that and other features in abeyance for the present. Perhaps something bearing on those points may be brought out in the discussion.

The following are some of the rules of the subways of New York City which have been promulgated as precautionary measures or as a result of actual experience:

No bare ends or bare portions of conductors, whether in or out of service, are per-

mitted in the manholes. Every conductor in the manhole is treated as though it were operative.

No joints except such as are protected by a metallic covering are permitted in the manholes.

No lights are allowed in manholes.

All conductors in manholes are required to be arranged symmetrically around the walls and to be plainly tagged with the designating mark of circuit and the name of the owner. One of the pictures (which I have, by the courtesy of Mr. Beckwith, the chief engineer of the subway company, been able to procure from his office) shows the cables passing through the manhole in rather a haphazard way. This would do where there are but one or two conductors in the conduit, but when the conductors multiply, an orderly arrangement of them is essential.

No switch boxes are allowed in the manholes. The reason for this is that, in the first place a switch box for each company would take up too much of the limited room; and secondly, in the case of electric-light circuits it is feared that attempts to switch live circuits might produce dangerous sparks in the manholes.

In conculsion, I think it may be said that the experience derived from the practical operation of the electrical subways of New York City, has either made apparent or confirmed among other things the following:

That it is possible to successfully operate all classes of electric conductors underground in cities;

That, at least for conductors conveying high-tension currents underground, it is advisable to set the standard of insulation high;

That regular insulation tests of conductors are very valuable;

That liberal thickness of insulation is desirable for high-tension currents;

That it is inadvisable to place underground new types of cable or insulation until they have been subjected to tests and conditions analogous to those to which they will be subjected underground;

That for electric lighting conductors—especially distributing mains—many conductors under one cover are not advisable, owing chiefly to the difficulty in making joints in such cables;

That all sharp edges in ducts should be avoided;

That until the gaslight companies are required, like the electric-light companies, to maintain their mains in a fairly sound condition underground, a means of ventilating the subways should be provided simultaneously with the construction of the subway;

And lastly, that while other features may be accessories thereto, the employment of smooth strong conduits, accessible ducts for distribution of the current, first-class insulation, constant expert attention to details and thorough organization in every department, are essential to the production of a successful electrical underground system.

RULES AND REGULATIONS OF THE BOARD OF ELECTRICAL CONTROL.

FOR OVERHEAD WIRES.

Unanimously adopted January, 1890, to take effect immediately, superceding all other rules.]

Wires are divided into two classes. First. Those for telegraph, telephone, etc. Second. Those for electric light and power.

POLES.

(1) Two lines of poles bearing conductors of a like class shall not be erected on any street or avenue.

(2) Two lines of poles shall not be erected on the same side of any street or avenue.

(3) Poles shall be set in the sidewalk 6 inches from the outside of curb, and no pole shall be placed within 10 feet of any lamp-post or other pole, except at street corners where necessary in order to support wires running on the cross street.

(4) All poles now standing, or erected hereafter, shall be branded or stamped with the initials of the company owning them, at a point not less than 5 nor more than 7 feet from the street surface; and when a pole is occupied by wires

belonging to more than one company, each group of cross-arms, or where necessary the support of a single wire of different ownership, must be distinguished by some characteristic paint, mark, or fastening.

(5) Electric-light lamp-posts shall be in accordance with a plan approved by the board.

(6) All poles carrying more than two wires shall be at least 45 feet high, uniform in size, straight, and painted from top to bottom—a very dark color from the sidewalk to a point 8 feet high, and a dark-green color above that.

(7) All poles for carrying not more than two wires shall be 25 feet high, straight, uniform in size, and painted from top to bottom—a very dark color from the sidewalk to a point 8 feet high, and a dark-green color above that.

(8) Cross-arms shall be uniform in length, strengthened by braces, and painted the some color as the poles, the cross-arms of each company being distinguished by some characteristic mark.

(9) Each line of poles must run on one side of the street only, except when absolutely necessary to change to the other side; but this may only be done by the permission of the board or of its engineer or expert.

(10) Poles shall be uniformly spaced, and about sixty to the mile. This requires on the short city blocks of 260 feet alternately three and two poles to the block.

(11) Conductors must not be placed upon fixtures erected or maintained for supporting wires of the other class.

(12) All existing regulations of the local authorities in regard to the placing of poles and stringing of wires are to continue in force, except when in conflict with these rules; and the rules and regulations of the New York Board of Fire Underwriters must be strictly observed.

(13) When any company is permitted to erect poles or other fixtures bearing lamps for the purpose of lighting the street or public places of the city, the permission is subject to the following provisions, which are expressly made a condition of said permits. Whenever the contract for lighting any such public places shall be given to another company, the company who erected said lamp-posts shall, on tender of the first cost thereof, yield possession of the same to the other company obtaining the new contract, except in cases where the company owning the lamp-posts prefers to remove them.

(14) All broken and "dead" wires, and all wires, poles, and fixtures not actually in use—subject to rule 28—must be removed. When a pole is taken down it must be removed from the streets the same day. New poles must not be brought upon any street more than two days in advance of their erection. Any pole that shall be on any street more than two days shall be removed by the department of public works at the expense of the party owning it.

WIRES.

(15) All wires shall be fastened upon poles or other fixtures with glass, porcelain, or rubber insulators approved by the expert, and must be stretched tightly and fastened with a strap of the same kind of wire.

(16) No wire shall be stretched within 4 inches of any pole, building, or other object without being attached to it and insulated therefrom. All wires strung on housetops must be 9 feet clear of roof.

(17) No wire shall hang within 25 feet of the pavement at the lowest point of sag between supports, except where required to reach a lamp or other connection, and must then be protected by extra covering and be rigidly fixed and out of the way.

(18) Every line, pole, fixture, etc., must be kept in thorough order, repair, and conformity with these rules and specifications, upon penalty of forfeiture of all permits granted to the owner by this board, but no additional poles or wires can be erected under cover of repairs, nor shall any route or location be changed without a permit.

ELECTRIC LIGHT AND POWER WIRES.

(19) All electric-light conductors shall be secured to insulating fastenings, and covered with an insulation which is waterproof on the outside and not easily worn by abrasion. Whenever the insulation becomes impaired it must be renewed immediately.

(20) All joints must be as well insulated as a conductor and the insulation of joints must be maintained. A rigid insulation sleeve clamped over the joint is preferred.

(21) Every wire must be distinguished by a number plainly marked on each cross-arm under the insulator. Day circuits must be conspicuously distinguished. All arc lamps must be so placed as to leave a space underneath of 9 feet clear between lamp and sidewalk.

(22) Every line entering a building shall be controlled by a cut-off placed near the entrance in sight and easily accessible.

(23) In the construction of lines the insulation to be used must be approved by the expert of the board in writing, and the insulation resistance must be maintained in accordance with the standard to be not less than 3 megohms per mile per 100 volts. And under no circumstances shall underwriters' wire be used.

(24) All connections with lines of electric-light conductors shall be made at right angles to the same; and connections to buildings shall be run straight across to the building and then down the front of the building.

(25) The insulation must be preserved throughout the entire circuit, and if any portion of a lamp or fixture is a part of a circuit and can be touched, it must be insulated.

(26) All conductors shall have a resistance uniformly distributed of not more than 30 ohms per mile per ampère, and proportionately less for heavier currents.

(27) All circuits must be tested every hour, and when a ground comes on, effort must be made to remove it at once. Failing in this, the current must be discontinued until the insulation is restored.

(28) No unused loops from electric-light circuit shall be allowed to remain after lamps are taken away, except in cases where it is positively known that the lamp would be required again within three months, and where there is no underground conduit for that class of circuits. When allowed to remain the joint in the loop must be as well insulated as the line itself.

(29) From and after date no company shall do business of electric lighting in the city of New York without a certificate of the board, granted on the recommendation and after inspection of the expert of the board, to the effect that its lines comply with all the rules and regulations of the board, and that its plant is in proper condition for the doing of its business. The force of the certificate to continue until changes are made, of which the board must be notified and approve, or so long as the plant and conductors remain in the same condition as when inspected.

LINEMEN.

(30) Every lineman must be furnished with rubber gloves and wear them and must wear a badge in a conspicuous place giving his number and the name of the company by whom he is employed.

PERMITS.

(31) All companies are authorized and directed to make necessary repairs t their lines of conductors. The general permit under which this may be don does not, however, cover the erection in any street, avenue, or highway of an additional poles or other similar fixtures, and has absolutely no reference wha ever to lines which have been ordered underground by the board, and whic the mayor has been requested to remove.

In the case of such lines, where notice has been given that underground accor modations have been provided, and the ninety days of notice required by la have elapsed, and the mayor has been requested to remove the same, compani owning or operating said lines are not authorized to make any repairs or conne tions or to go up on the poles bearing such lines for any purpose whatever exce to remove the said lines of electrical conductors in conformity with the directio of the board.

(32) The secretary is authorized to issue to companies operating electrical c ductors all permits required by them for the making of connections necessary the business of said companies with lines now in use, and which the mayor not been requested to remove, upon the certification of the expert that there no subway in the street in question for this class of conductors. Said conn tions are to be in every case in accordance with the rules and regulations of board.

(33) All permits of the board for overhead wires and fixtures are granted o pending the providing of underground accommodations in the neighborhood the street or avenue for which the permit is granted.

(34) Any member or officer of the board, and every inspector employed by it,

as well as every member of the police force of the city, shall be entitled to examine permits under which work of any kind is being done.

(35) No permit shall be granted for the erection of any overhead structure nor for the renewing of any lines already existing in any street in which underground accommodations for the service have been provided, and the ninety days' notice required by law has elapsed.

(36) The violation of any of the rules and regulations of the board shall operate *ipso facto* as a revocation of the permit held by the company or person guilty of such violation.

(37) Every company or person erecting poles, wires, or fixtures must make and leave, at least once each week, at the office of the board, such records of the fixtures, etc., which they are erecting, and of all of the same that they have in use, as is required by the engineer and the electrical expert of the board, and in such form as shall be prescribed by them.

(38) The companies or persons owning or controlling poles in any street or avenue shall allow the same to be used by other companies or persons operating conductors for similar electrical service when authorized to do so by the board, on tender of proper compensation, to be determined by agreement between the parties interested. In default of such an agreement the amount of such compensation shall be determined by the board. This rule imports a contract on the part of each company or person owning or controlling the poles on any street or avenue, not only with the board, but also with each company or person who shall under its terms be qualified to demand the privileges it confers, to permit this joint use of poles.

And in accepting any permit the applicant thereby binds himself to this agreement.

SECTION B.—AS TO UNDERGROUND WIRES.

Rules and regulations governing the occupancy of the subways of the Consolidated Telegraph and Electrical Subway Company.

[Approved by the Board of Control, April 17, 1888.]

SECTION 1. SPACE, APPLICATION FOR.

All applications for space in the subways shall be made in writing and shall give—

(*a*) The name of the applicant.

(*b*) The term for which the use of the conduit or conduits is wanted.

(*c*) The number, material, and dimensions of conductors proposed.

(*d*) The arrangement of said conductors, whether singly or in cables, and if in cables the number of conductors and their disposition in each cable.

(*e*) The maximum electro-motive force of the machine or machines supplying the current to be used.

(*f*) The nature of the insulating material or materials to be employed, and

(*g*) Such other specific information as will fully explain the use to be made of the space desired.

SECTION 2. REPAIRS AND ALTERATIONS OF CONDUCTORS, APPLICATIONS FOR.

All applications for permits to make repairs or alterations in conductors in the subways shall be made in writing, and shall give—

(*a*) The name of the applicant.

(*b*) A complete identification of the conductor or conductors referred to and of the particular conduit or conduits to which access is desired.

(*c*) So far as possible, the extent and character of the proposed repairs or alterations, and of the probable date when the same will be completed, and the conductor or conductors restored to condition for use.

(*d*) The insulation resistance of the conductor or conductors, as shown by the latest test, and the date of said test. Immediately after any repairs or alterations are made to a conductor or conductors, a report giving them in detail shall be made to the subway company.

SECTION 3. REPAIRS AND ALTERATIONS OF CONDUCTORS TO BE MADE BY LESSEES.

Whenever, in the judgment of the subway company, or its properly authorized agent, repairs or alterations in a conductor or conductors is necessary, said repairs or altera ions shall be made by the party owning or controlling said conductor immediately upon notice. During the progress of any repairs or alterations upon or in a conductor or conductors, the party owning the same shall take such precautions as may be necessary or expedient to protect the conductors of other parties from injury.

SECTION 4. ELECTRO-MOTIVE FORCE.

All conductors drawn into and operated in the conduits and intended to convey currents of an electro-motive force exceeding 100 volts shall have at the temperature of 75° an initial insulation resistance of not less than 50 megohms per mile per 100 volts electro-motive force of current in the circle. Whenever the insulation resistance of a conductor as aforesaid shall prove to be less than 5 megohms per mile per 100 volts the use of that conductor shall at once cease, unless the actual electro-motive force in its circuit be reduced so as to reëstablish the foregoing ratio.

SECTION 4a. ELECTRIC-LIGHT CABLES.

No two or more conductors having a difference of potential exceeding 500 volts shall be placed in the subways if made in a single cable. This applies to the outgoing and incoming sides of arc-light circuits.

SECTION 5. INSULATION—RESISTANCE OF BRANCHES AND FEEDERS.

The insulation resistance per mile length of all branches and feeders of the main conductors shall at least equal that of the respective conductors to which said branches and feeders are connected.

SECTION 6. INSULATION—DETERMINATION OF RESISTANCE AND TESTS.

The insulation resistance of each length of cable or conductor shall be determined before said length is laid in the subway. In making this determination an electro-motive force of current of not less than 150 volts shall be employed, and the minimum initial resistance, as provided in rule 4, shall not be diminished through and after an immersion of the conductor under test of at least sixty consecutive hours. All lines shall be tested for insulation resistance immediately after completion in the subway, and those carrying currents of over 1 ampère shall be tested daily thereafter for a period of one month, and thereafter at least weekly. A conductor shall be tested for insulation immediately after any new connection with, addition, or repair to or alteration of any sort in said conductor is made, and also whenever any other conductor is placed in the same tube; conductors conveying currents of less than 100 volts electro-motive force are excepted from this rule.

SECTION 7. TESTS—REPORTS TO BE FILED WITH SUBWAY COMPANY.

All tests and determinations called for by these rules shall be made by parties owning or controlling conductors. Duly authenticated records of the results of such tests and determinations within twenty-four hours after the completion of the same shall be filed with the subway company, which shall have power to verify or repeat such tests or determinations in its discretion.

SECTION 8. ALTERATIONS AND ADDITIONS TO SUBWAYS TO BE MADE BY SUBWAY COMPANY.

All alterations of or additions to the subways for the purpose of connecting conductors therein with points outside will be made by the subway company upon the request of the lessee desiring the same, provided the same have been authorized by the board of electrical control, and that the expense of making such additions or alterations is satisfactorily guaranteed by the parties desiring them.

SECTION 9. RENTALS—TERMS OF CONTRACT.

Rental to be paid yearly in advance. Applicants will be required to enter into a written contract, with satisfactory guaranty for its performance.

SECTION 10. ACCESS TO SUBWAYS AND MANHOLES; STREET COVERS TO BE LOCKED.

All manholes will have the inner cover locked with a special manhole padlock of the subway company, the keys of which shall be kept in the company's office.

PENALTY FOR TAMPERING.

(a) Any attempt to gain admittance to the manholes and access to the company's property, or to the property of its tenants, without a permit from the company, by opening or breaking said lock, cover, bar, or other portion of the manhole, will be prosecuted to the full extent of the law.

RIGHT OF ACCESS.

(b) Access to the subways shall be limited to the authorized representatives (1) of the board of electric control, (2) of the Consolidated Telegraph and Electrical Subway Company, and (3) of the lessees or occupants of the ducts.

PERMITS FOR ACCESS.

(c) Access to the subways will be had by permit issued to the applicant by the subway company upon a written application in the name of the lessee or occupant of the ducts filed in the office of the company, giving twenty-four hours' notice.

There will be no delay by the company under ordinary circumstances in giving access to the subways, but in cases of emergency the company reserves the right, in their judgment, to deny access or to postpone the same.

ACCESS TO SUBWAYS IN PRESENCE OF SUBWAY INSPECTOR.

(d) Access to the subways shall only be had in the presence of a subway inspector of the subway company, who shall hold possession of the keys to the manholes, who shall see that the manholes are properly opened and closed by the applicant, who shall remain present during the operations of the applicant, and who is hereby charged by the company with the duty of seeing that the company's property and the property of the tenants of the company are not injured by the operations of the applicant. The inspector is also charged with the enforcement of all rules and regulations relating to the use of the subways, and he may suspend any employé of the applicant engaged on the work connected with the subways who shall violate any of these rules and regulations.

The subway company, by its properly authorized agent, shall have authority to require such alterations in conductors as it may deem necessary for their safety or the safety of the subway or of the adjacent conductors; and also to cause the current in any conductor to be interrupted or reduced for such period of time as may be requisite in the judgment of said agent for the proper protection or necessary convenience of persons working in the manholes or upon the subways in the vicinity of said conductor.

MANHOLES GUARD FRAMES.

(e) Whenever a manhole is opened, the applicant shall place an iron frame, furnished by the subway company, in the street opening, with a red flag about one foot square, with the letters "C. T. & E. S. Co." thereon, displayed on a staff set in a socket in the frame, as a warning to the public.

PRECAUTION AGAINST GAS IN MANHOLES.

(f) When manholes are opened, before commencing work the applicant shall satisfy himself that they are free from gas, and if not, he shall ventilate the manholes. The subway company will provide for such purposes a fan or blower to be operated by the applicant for such time as may in the judgment of his

authorized representative be sufficient to clear the manholes of the gas to such an extent as to render it safe for his workmen to enter therein; and no light shall be used by the applicant in his operations in the manhole except when the above examination has shown the absence of gas. If, after the first ventilation, gas is noticed, the applicant shall cause the ventilation to be continued.

WATCHMEN ON SURFACE.

(*g*) In all work conducted in the manholes one man shall always be provided by the applicant to act as watchman on the surface at each manhole when opened, who shall keep constant guard and warn pedestrians, drivers of carriages, trucks, street cars, etc., and who shall assist the subway inspector in whatever the latter requires in emergencies.

SMOKING PROHIBITED.

(*h*) The applicant shall prohibit his employés from smoking in or around manholes.

INTOXICATING LIQUORS PROHIBITED.

(*i*) No one under the influence of liquor shall be allowed to engage in work in the subways.

PROTECTION AGAINST DUST AND WIND.

(*k*) No cover of any kind whatsoever shall be allowed by the applicant to be placed over the manhole opening; but a shield may be placed around the windward half of the iron frame to protect the workmen from dust and wind.

SECTION 11. DAMAGES.—SUBWAY COMPANY NOT RESPONSIBLE.

In no case will the subway company be responsible for any damage whatsoever to persons or property due to the existence or employment of the subways or the conductors therein, or any apparatus connected therewith. The subway company will, however, use every reasonable precaution to prevent damage from any cause within its control.

SECTION 12. AMENDMENTS TO RULES AND REGULATIONS.

The subway company reserves to itself the right to add to or amend these rules from time to time, as may, in its judgment, be necessary, subject to the approval of the board of electrical control.

ACCIDENTAL DEATHS BY ELECTRICITY IN NEW YORK CITY DURING THE YEAR 1889.

[From official report of board of electrical control.]

With reference to the accidents which have occurred in the streets and which have been investigated by me, I have to report that in my judgment they would all have been prevented by observance of the rules and regulations of the board. The deaths which have occurred and the causes are given below.

Meyer Streiffer, a peddler, was killed on East Broadway, April 14, 1888, by touching a hanging telegraph wire in contact with a United States Company's circuit. This death would not have occurred if all broken and "dead" wires had been removed, under the rules of the board, and in all probability it would not have occurred had a proper insulation been maintained in conformity with the rules by the United States Illuminating Company.

Fred Witte, clothing salesman, was killed at 200 Bowery, April 28, 1888, by touching a United States Company's lamp. This death would not have occurred had the lamp been properly insulated and sufficiently high above the pavement.

John E. Feeks, a lineman of the Western Union Telegraph Company, was killed while in the performance of his duties at the corner of Chambers and Center streets, on October 12, 1889. This death was due to the neglect of electric-lighting companies to carry out the rules and regulations of the board of electrical control with reference to insulation and to the keeping away from the wires of the telegraph and telephone companies.

Henry Harris, a clerk, was killed by the Brush current, November 30, 1889, while carrying a show case into a store. This death was due to the fact that the lamp of the Brush Company was not properly insulated and the wires which carried the current to it were not properly insulated, and the lamp was nearer the sidewalk than is proper.

PHILADELPHIA.

LETTER FROM THE MAYOR TO THE COMMISSION.

OFFICE OF THE MAYOR,
Philadelphia, February 6, 1891.

GENTLEMEN: His honor Mayor Edwin H. Fitler directs me to acknowledge receipt of your letter of January 22, requesting information concerning electric wires, conduits, etc., and as a reply thereto to forward you the inclosed communication from the chief of the electrical bureau, and, under separate cover, the printed matter and blue prints mentioned in the chief's letter. His honor trusts that the information furnished may be of use to you.

Yours, respectfully,

LEWIS E. BEITLER,
Mayor's Secretary.

The ELECTRICAL COMMISSIONERS,
Washington, D. C.

The following is a copy of the letter above referred to:

ELECTRICAL BUREAU,
Philadelphia, February 5, 1891.

DEAR SIR: Referring to the letter of Francis R. Shunk, secretary board of electrical commissioners, Washington, D. C., of date of January 22, to his honor the mayor referred to you, and by you to me for reply, allow me to say:

The chief of the electrical bureau, representing the department of public safety, is, by ordinance, invested with authority to supervise, maintain, and control all municipal electrical matters, and of the supervision of maintenance and construction of the poles, wires, and fixtures for overhead, and of the conduits, manholes, etc., for underground electrical construction, belonging to private companies, corporations, or individuals, and all other electrical matters whatsoever, in so far as they relate to the highways of the city of Philadelphia. By such a concentration of authority the experience of this city has been that a better system of electrical construction is secured and maintained than could possibly be attained where authority is divided.

All companies, corporations, firms, or individuals using the highways of the city for electrical purposes are required to make annually sworn returns to the chief of the electrical bureau of the number of poles, mileage of wire, attachments to poles belonging in whole or in part to the city, and the amount of conduit and mileage of wire laid under ground. The chief is empowered to issue licenses for one year for the maintenance of the overhead service, for which license charges fixed by ordinance are made as follows:

For each new pole erected, $5; for the maintenance of each and every pole, $1; for each mile or fraction thereof of overhead electric-light wire, $5; for each mile or fraction thereof of telegraph or telephone wire, $2.50; and for each attachment to poles belonging in whole or part to the city of Philadelphia, 50 cents. The chief of the electrical bureau annually makes a report to the director of the department of public safety, showing in detail the operation of the various interests under his control, together with such recommendations as may, in his judgment, better serve the city's interest.

Replying to the request for information, "whether the same or separate conduits are used for high potential and telephone circuits:" There are no general system of conduits in this city. Each corporation or company desiring underground facilities makes application to city councils for the privileges, and, if

granted, lay conduits and cables for their own use. This of necessity separates the cables carrying high-tension currents from the telephone circuits. In the conduits laid by the city there are cables carrying currents of high potential side by side with those used for telephone service. No trouble is experienced while the telephone circuit is used in metallic, but if ground, the intensity of the induced current greatly interferes with its use. This cable, 3 miles in length, has been in use since 1886. Taking this as an example, I see no reason, if the telephone wires are used in metallic, and if the cables be properly protected, why they should not be placed in the same conduit. It is my opinion that the public authorities, where convenient, should build subways of brick or masonry the full length of certain avenues or streets, every four or six blocks apart, from which, at such street crossings as may be necessary, lateral branches of conduits could be laid to such points as may be desired to reach. If built sufficiently large the subways should contain the mains for gas and water, making them accessible at all times without disturbing the street surface. This would seem the only feasible method to prevent the constant tearing up of the streets for the introduction of or repair to substructures.

I herewith inclose copies of such ordinances as are in pamphlet print, together with copies of the annual reports from 1884 to 1889, the rules and regulations of the board of highway supervisors, copies of the forms upon which the annual returns are made to the electrical bureau, and blue prints of such matter as may be useful.

The annual report of the chief of the electrical bureau for 1890 will be sent you when received from the printer, in which will be found a complete list of the electrical companies now operating in Philadelphia.

Very respectfully,

D. R. WALKER,
Chief of Bureau.

Hon. W. S. STOKLEY,
Director Department of Public Safety.

LAWS AND ORDINANCES RELATING TO ELECTRICAL CONSTRUCTION IN PHILADELPHIA.

Under ordinance, date of December 9, 1868, a department, to be called the department of the police and fire-alarm telegraph, was created, the head of which was called the superintendent of police and fire-alarm telegraph, who shall have the care and management of the police and fire-alarm telegraph and of all persons employed under said department; provided that nothing herein contained shall be so construed as to interfere with the right of the mayor to have full and unlimited control over the telegraph wires for the transmission of messages for municipal purposes; the said superintendant to be elected by joint convention of city councils for the term of three years, and in case of vacancy caused by death, resignation, or otherwise, the election for said officer shall be for the balance of unexpired term. Under the new city charter the chief is appointed by the director of public safety.

Under ordinance, date of July 11, 1884, the department commonly known as the department of police and fire-alarm telegraph shall be known and designated as the electrical department, and the chief officer thereof as chief of the electrical department. Under the new city charter the department became a bureau in the department of public safety.

Ordinance of April 18, 1863, provides that "all telegraph lines erected within the limits of the city of Philadelphia shall be erected under the supervision of the superintendent of the police and fire-alarm telegraph."

It shall not be lawful for any telegraph company, person, or persons to erect any pole or poles in any of the streets, lanes, or alleys of the city of Philadelphia, or to change the route of any telegraph line now erected, unless authorized by councils; and it shall be the duty of the superintendent of the police and fire-alarm telegraph to report any violation of this ordinance to the mayor, who is hereby authorized to notify the company, person, or persons violating this ordinance to remove the said obstructions within twenty days under a penalty of $200 for every sixty days the said obstructions are allowed to remain after the expiration of said notice: and the said superintendent shall report any company, person, or persons who have changed the route of their telegraph line or lines within

ity limits without authority of law to the mayor, who shall cause the said or lines so changed to be removed back to their former route under like lty as above.

dinance of January 6, 1881, states that whenever permission has been ted by councils to any corporation, firm, or individual to construct a line of graph which requires the erection of poles in or upon any of the public streets ghways within the corporate limits of the city of Philadelphia, it shall be luty of such corporation, firm, or individual, before any pole shall be erected, bmit to the superintendent of the police and fire-alarm telegraph a writ- pplication specifying the number and size of poles intended to be erected, designating the places where the same are intended to be inserted, and if bjection be made hereto it shall be the duty of the superintendent of the e and fire-alarm telegraph to issue a license to the said applicant for the tion of the specified poles at the designated places of insertion. In case of ction being made to the whole or any part of such application, it shall be the of the superintendent of police and fire-alarm telegraph to hear the same to grant the license either in accord with the application or with such con- ns and modifications to secure the purposes of this ordinance, as the case require.

o pole shall be newly erected without the license of the superintendent of police and fire-alarm telegraph shall have been previously obtained there- as provided in this section, and for every license so granted there shall be l to the city treasurer for the use of the city the sum of $5 per pole.

ECTION 2. It shall be the duty of the superintendent of police and fire-alarm graph to cause a thorough and careful inspection to be made, at least once very year of all telegraph or telephone poles erected within the corporate its of the city of Philadelphia, and if any pole shall be found defective or gerous from any cause, he shall notify the corporation, firm, or individual ing such pole, who shall forthwith replace the same with a sound pole, and he said owner neglect or refuse to replace such defective pole within forty- ıt hours after receiving such notification, he or they shall be liable to a fine 5 for each and every day during which said neglect or refusal shall continue, e collected as debts of like amount are now by law recoverable.

EC. 3. All telegraph poles now erected, or hereafter to be erected in the city Philadelphia, which are or shall be owned by any corporation, firm, or in- idual, shall be designated by the names or initials of such owner, and each of l poles shall be painted and bear a distinctive number, together with the names nitials, and number shall be legibly marked with oil paint upon the poles so ignated. It shall be the duty of such owner or owners, on or before the first nday of February, and annually thereafter on the first Monday of January in h and every year, to make application to the superintendent of the police and alarm telegraph for a license to maintain the poles theretofore erected for ensuing year, specifying the poles so to be maintained by their designation, as vided for in this section; and the superintendent of the police and fire-alarm graph shall issue a license to such applicant, which shall authorize the main- ance of the poles designated in the application, only for the period of one year n the 1st day of January next ensuing the date of said application, and no longer, l the charge for issuing such license shall be the sum of $1 for each and every e authorized to be maintained thereby, and shall be paid to the city treasurer the use of said city.

EC. 4. On and after the 1st day of January, A. D. 1881, no telegraph pole shall maintained within the corporate limits of the city of Philadelphia without nnual license for the maintenance thereof shall have been previously granted the same, in accordance with the provisions of section 3 of this ordinance; any vilege heretofore granted by resolution or ordinance for the erection and intenance of poles for telegraphic or telephonic purposes be, and the same are eby, repealed. Any person or persons violating the provisions of this section ll be liable to a fine of $50 for each and every telegraph pole so maintained hout license, to be recovered as debts of like amount are now by law recover- e.

EC. 5. Upon complying with the provisions and requirements of this ordinance, l the privileges heretofore granted to such individuals, companies or corpora- ns, by resolution or ordinance, shall not in any way be affected. The councils he city of Philadelphia, however, reserve the right to revoke by ordinance of the privileges mentioned in this or any other ordinance or resolution.

Under ordinance of February 21, 1881, the superintendent of police and fire- rm telegraph is hereby authorized and directed to remove from the poles owned whole or in part by the city of Philadelphia, after the first Monday of April,

1881, all wires and fixtures belonging to any firm, corporation, or individual who have failed to comply with the provisions of the ordinance entitled "An ordinance to provide for the payment of an annual charge for the use of telegraph poles belonging to the city of Philadelphia," and to carry the same into effect, approved December 21, 1880.

Ordinance of date of December 21, 1880, states that individuals, companies, or corporations now using, or who may hereafter use or attach, any telegraph or telephone wires or fixtures to the telegraph poles belonging in whole or in part to the city of Philadelphia shall pay to the city treasurer, for the use of said city, annually the sum of 50 cents for each and every attachment made to each and every pole.

SEC. 2. Each and every individual, company, or corporation having telegraph or telephone wires or fixtures attached to the telegraph poles owned in whole or in part by the city of Philadelphia shall, in writing, on or before the 1st day of March, 1881, and annually thereafter, certify to the superintendent of the police and fire-alarm telegraph the number and location of such attachments, and upon complying with the provisions and requirements of this ordinance, the privileges heretofore granted to such individuals, companies, or corporations, by resolution or ordinance, shall not be in any way affected.

SEC. 3. It shall be the duty of the superintendent of the police and fire-alarm telegraph to furnish the city treasurer, on or before the second Monday of March, 1881, and annually thereafter on or before the second Monday of January, the number and location of said attachment for which each individual, company, or corporation is liable and required to pay for under this ordinance; and it shall be the duty of such individual, company, or corporation to pay to the city treasurer, for the use of the city, as aforesaid, the charge or amount due on such attachment within thirty days after the return, as hereinbefore specified, is made by the superintendent of the police and fire-alarm telegraph.

SEC. 4. Upon the failure of any individual, company, or corporation to pay to the city treasurer, on or before the time specified in section 3 of this ordinance, the sum or amount due by such individual, company, or corporation for the privileges hereinbefore specified, notice of such failure to pay shall in writing be furnished by the city treasurer to the superintendent of police and fire alarm telegraph within fifteen days thereafter; and the superintendent of the said police and fire-alarm telegraph is hereby directed and authorized, upon the receipt of said notice, to proceed at once and remove from said poles all telegraph or telephone wires, fixtures or attachments belonging to or placed there by such defaulting individuals, companies, or corporations.

SEC. 5. That hereafter no individual, company, or corporation shall place any telegraph or telephone wires or fixtures on any telegraph pole or poles owned in whole or in part by the city of Philadelphia, without permission is first given by these councils, by the passage of an ordinance to that effect. And in case any wire, wires, or fixtures shall be placed on any such pole or poles, without such authority first obtained, then the superintendent of the police and fire alarm telegraph is required and directed to remove the same without notice.

SEC. 6. It shall be the duty of the superintendent of the police and fire alarm telegraph to furnish within fifteen days after the passage of this ordinance, a certified copy thereof to all individuals, companies, or corporations affected by the provisions thereof.

SEC. 7. All privileges heretofore granted by resolution or ordinance shall be revocable by the passage of an ordinance without notice to that effect; and all ordinances or resolutions or parts of ordinances and resolutions inconsistent with the provisions of this ordinance are hereby repealed.

Ordinance of September 20, 1887, provides:

SECTION 1. That it shall be the duty of the superintendent of the police and fire-alarm telegraph to collect all sums now due or which may hereafter become due to the city of Philadelphia, by any parties or persons whomsoever, for the privilege of using the police and fire-alarm telegraph poles, which said sums shall be due and payable on the first Monday of January in each year.

SEC. 2. It shall be the duty of the said superintendent to remove the wires of any person or persons who shall fail or neglect to pay the annual charge due for such privileges after thirty days' notice that the same is due and payable.

Ordinance of January 3, 1884, provides:

That from and after the passage of this ordinance no telegraph, telephone, or electric-light wire shall be erected over or across any of the streets, alleys, or roads in the city of Philadelphia, without permission being first obtained from the councils by the passage of an ordinance to that effect, and no wire shall be

strung without a permit is first obtained from the department of police and fire-alarm telegraph.

SEC. 2. Any violation of the provisions of this ordinance shall subject the offender or offenders to a fine of $10 for each and every offense, and shall be collected as like penalties are now by law collectable. All ordinances or parts of ordinances inconsistent with the provisions of this ordinance be, and the same are hereby, repealed.

Ordinance of April 14, 1866, provides:

SECTION 1. That it shall not be lawful for any person or persons to post, paste, or fasten any printed, painted, or written signs, showbill, placard, circular, or advertisement of any description whatsoever upon any telegraph pole or post within the city of Philadelphia.

SEC. 2. Any person violating any of the provisions mentioned in the first section of this ordinance shall forfeit and pay for each offense a penalty of $5, to be sued for and recovered as penalties are by law recoverable.

The above ordinance was amended, as follows:

Ordinance approved April 14, 1886, relating to posting, pasting, or fastening showbills, placards, etc., upon city telegraph poles and posts, be so amended so as to apply with equal force and effect to the metal boxes erected on the sidewalks for the use of the police patrol system and lamp-posts; the penalty for violating the ordinance shall be a fine of $5 for each and every offense, to be collected as like penalties are now by law collectible.

The ordinance of June 13, 1882, provides:

SECTION 1. That prior to the 1st day of January, 1885, all poles and wires erected for telegraph, telephone, and electric light purposes by firms, corporations or persons other than the city of Philadelphia, shall be removed from the streets of the city of Philadelphia.

SEC. 2. That it shall be unlawful, after the above date, to erect or maintain any poles or wires for the above-mentioned purposes in the streets of Philadelphia, excepting as provided in section 1, so far as relates to the city of Philadelphia.

SEC. 3. That any corporation, or person or persons, excepting the city of Philadelphia, erecting and maintaining any poles or wires for the above purposes, in violation of the provisions of this ordinance, shall forfeit $50 for every day each of said poles is maintained, to be recovered as like penalties are now recoverable by law.

By resolution of councils of date of 11th of June, 1885, it was resolved that the chief of the electrical department be, and is hereby, instructed to notify the various telegraph and telephone companies that all overhead wires between Vine and South streets and the Delaware and Schuylkill Rivers must be removed before January 1, 1886, and the said chief of the electrical department is hereby instructed to remove all overhead wires between the limits named remaining in place on the date named.

By resolution of councils of date of January 21, 1886, it was resolved as follows:

Whereas the chief of the electrical department was by resolution of June 11, 1885, instructed to "notify the various telegraph and telephone companies that all overhead wires between Vine and South streets and the Delaware and Schuylkill Rivers must be removed before January 1, 1886," and requiring him to remove all overhead wires between the limits named remaining in place at the date aforesaid: and

Whereas by the removal of the overhead wires at the time mentioned the greatest inconvenience will be sustained by the public, and serious losses will be incurred by the business community; and in order that such inconvenience may be avoided pending the passage of certain ordinances now under consideration by the electrical committee of these councils; it is therefore

Resolved, That the chief of the electrical department be, and he is hereby, directed not to enforce the removal of overhead wires, as required by the resolution of June 11, 1885, for the present.

Ordinance of 16th day of February, 1886, provides:

That the chief of the electrical department be, and is hereby, authorized to issue permits for the erection of such electric-light poles and wires as may be required for the lighting of the public streets: *Provided*, That none of the poles so erected shall be used for supplying light for private purposes, and that the said permits shall specify that the poles shall be removed at any time councils may by resolution so direct, or they shall be removed on a revocation of that permit by the chief of the electrical department.

Ordinance of March 30, 1883, reads:

SECTION 1. That all corporations, firms, or persons to whom permission has heretofore or which may hereafter be granted for running or laying underground circuits, tubes, or pipes for electrical conductors or cables or wires, or all corporations, firms, and persons to whom permission has heretofore or which may hereafter be granted for the erection of poles, fixtures, cables, wires and conductors, in or over the streets or housetops in the city of Philadelphia, shall conform to the requirements of this general ordinance.

SEC. 2. That no street, alley, lane, or road in the city of Philadelphia shall be broken or occupied by any corporation, firm, or person for the purpose of laying down conduits, tubes or pipes for electrical conductors, cables, or wires, unless authority by ordinance be first obtained; that during the construction or laying of said underground conduits, tubes, pipes, conductors, cables, and wires no street, alley, lane, or road shall be opened or the paving broken into for a greater distance than 500 feet at any one time, and that no section of 500 feet shall be kept open for a longer period than five days, and said opening or trench shall not be of a greater width than 2 feet, and as the work progresses the paving shall be promptly relaid, and the street, alley, lane, or road put in good condition.

SEC. 3. Prior to making an opening in any street, lane, alley, or road for the laying of conduits, tubes, or pipes for electrical conductors, cables, or wires the corporation, firm, or person desiring to lay the same shall make application in writing to the department of police and fire alarm telegraph, and shall file plans and specifications with said department, showing the location, route, and length of the proposed conduits, pipes, or tubes, and on the issuance of a certificate to the effect that the route or routes and plans or specifications meet with the approval of the superintendent of the police and fire alarm telegraph, the chief engineer and surveyor, and the chief commissioner of highways, thereupon the chief commissioner of highways shall have authority to issue the necessary permit on compliance with the provisions of section 9 of this ordinance, for the opening of such street, alley, lane, or road, as set forth in the applications and plans, as are proposed to be occupied. In addition to filing the plans and specifications as hereinbefore provided, duplicates of the same shall also be filed in the departments of highways and surveys, and neglect on the part of the applicant to file such papers on the opening of any street, alley, lane, or road, without a permit having been first obtained shall forfeit the right of any corporation, firm, or person to use or occupy any street, lane, alley, or road. The work of laying underground conduits, tubes, pipes, electrical conductors, cables, and wires shall be under the direction and to the satisfaction of the superintendent of the police and fire alarm telegraph, who at all times shall have free and unobstructed access to the conduits, tubes, pipes, electrical conductors, or cables for the purpose of inspecting the same or making connections therewith for wires or conductors in use or to be used by the city.

SEC. 4. That all corporations, firms, or persons occupying any street, lane, alley, or road with underground conduits, tubes, pipes, cables, electrical conductors, or wires, shall be liable for all damages to gas and water main services and sewers, connections to sewers, and also for any damages caused by the opening of trenches, or condition of the streets, alleys, lanes, or roads, resulting from the laying of conduits, tubes, pipes, electrical conductors, cables, or wires, or making connection for which the city of Philadelphia would otherwise be liable, and the bond provided in section 9 of this ordinance shall contain a provision to that effect.

SEC. 5. That when the city of Philadelphia may desire to use or occupy any of the wires or conductors in any of the conduits, tubes, pipes, or cables for police, fire alarm, or other municipal purposes, the corporation, firm, or person to whom privileges have heretofore or shall hereafter be granted for the laying of underground conduits, tubes, pipes, electrical conductors, cables, or wires, shall furnish the superintendent of the police and fire alarm telegraph with one and not more than three conductors or wires upon thirty days' notice to any such corporation, firm, or person, free of any cost to said city, the superintendent of the police and fire alarm telegraph to have the whole and absolute control of such electrical conductors or wires as he shall elect to use for the purpose named.

SEC. 6. That all corporations, firms, or persons having telegraph, telephone, or electric-lighting wires, electrical conductors or cables on telegraph poles belonging in whole or in part to the city of Philadelphia, or on any other poles or fixtures, or over housetops, or in any way suspended above ground or placed underground, shall, in writing, on or before the first Monday of April, 1883, and annually thereafter on or before the second Monday of December, certify under

oath to the superintendent of the police and fire-alarm telegraph the actual number of wires, location, and the miles of wire and electrical conductors, whether suspended singly or in cable, tubes, pipes, or conduits above ground or underground owned, leased, or controlled by them in the city of Philadelphia. Failure to make such a return within the time provided for in this ordinance shall subject the offenders to a penalty of $50 per day until such return is made.

SEC. 7. That on all conductors or wires suspended above ground, excepting such as are used or owned by the city of Philadelphia, an annual payment of $5 per mile or any part thereof in length for conductors for electric-lighting purposes for each and every wire conductor, and of $2.50 per mile or part thereof in length of wires or conductors for each and every wire or conductor used or to be used for telegraphic, telephone, or other purposes.

The ordinance of August 5, 1886, provides:

That every company, corporation, firm, or individual desiring to lay or construct a line or lines of telegraph, telephone, electric-light wires, electrical conductors, conduits, cables, or pneumatic tubes under any of the streets or highways of the city, shall first file with the board of highway supervisors an application in writing, accompanied by a general plan and specification, showing the location of the proposed work, and, so far as shall be practicable, that of all structures existing under said streets or highways upon which they may desire to lay or construct their line or lines of wires, electrical conductors, conduits, cables, or tubes.

SEC. 2. In order to avoid the placing of unnecessary wires, electrical conductors, conduits, cables, or tubes on streets or highways already occupied, and to avoid interference with the water, gas, and sewerage systems of the city, the board of highway supervisors shall have authority to alter and change the route or plans submitted by any company, corporation, firm, or individual, as they may think for the best interests of the city, and upon the approval of a route and plan by the said board of highway supervisors they shall cause said route and requirements to be drafted into the form of an ordinance, to be submitted to councils for their approval or disapproval. The said ordinance shall be accompanied by plans approved by the board of highway supervisors.

SEC. 3. The board of highway supervisors are hereby authorized, upon the passage of a resolution by councils, to grant permission to any company, corporation, firm, or individual to which privileges have been or may hereafter be granted for the construction of main lines of telegraph, telephone, electric-light wires, electrical conductors, conduits, cables, or pneumatic tubes, to lay or build branch lines therefrom not extending beyond three squares direct from the main lines, which privilege shall be revocable at any time by councils.

SEC. 4. The laying, construction, and maintenance of all wires, electrical conductors, conduits, tubes, or cables shall be under the supervision of the chief of electrical department and subject to his approval, and the same shall be laid under the rules and regulations of the board of highway supervisors.

SEC. 5. That every company, corporation, firm, or individual to which privileges have been or may hereafter be granted, for the laying or construction of a line or lines of wires, electrical conductors, conduits, cables, or tubes shall be liable for any injury or damages to gas, water mains, pipes, or sewers, by the opening of the streets or the laying of their wires, electrical conductors, conduits, cables, or tubes therein, and this condition shall be set forth in the bond provided for in section 11 of this ordinance.

SEC. 6. That whenever the city may desire to use or occupy any of the wires, electrical conductors, or cables for municipal purposes, the company, corporation, firm, or individual to which the privilege has or shall hereafter be granted for laying or constructing such lines or branches shall furnish three good working wires, upon thirty days' notice, to the electrical department without any cost to the city.

SEC. 7. That whenever the city may desire to occupy or use a tube or chamber in any of the conduits or tubes which have heretofore been or may hereafter be laid by authority of councils, the company, corporation, firm, or individual owning such conduit shall, upon thirty days' notice from the chief of the electrical department, furnish said department, free of cost or charge to the city, at least one tube or chamber in such conduits or tubes: *Provided*, That this section shall not be construed to apply to companies, corporations, firms, or individuals laying wires who shall have complied with section 6 of this ordinance, of which compliance the chief of the electrical department shall be the judge.

SEC. 8. That every company, corporation, firm, or individual to which privileges have been granted for the laying of pneumatic tubes shall, upon notice

from the chief of electrical department, supply free service to the city of Philadelphia and the departments thereof between such points as are or may be reached by their system.

SEC. 9. Every company, corporation, or individual to which privileges have heretofore or may hereafter be granted for the laying of wires, electrical conductors, conduits, cables, or tubes, under any of the streets or highways of the city, shall, on or before the first Monday of November in each and every year, certify under oath, to the chief of the electrical department, the number and location of wires, electrical conductors, conduits, cables, or tubes and the miles of wires laid underground by authority of ordinance. Upon failure to make such a return, on the part of any company, corporation, firm, or individual, within thirty days from the time specified, the privileges granted by this or any other ordinance, or by the board of highway supervisors, under resolution of councils, shall cease and determine, and the chief of the electrical department shall thereupon cause the wires, electrical conductors, conduits, cable, or tubes to be either disconnected from the buildings or removed from the streets; any expense or cost resulting therefrom shall be charged to and against such company, corporation, firm, or individual, and the city solicitor is directed and authorized to collect such cost from such company, corporation, firm, or individual, for such disconnection or removal, by proceeding upon the bond as required to be given by them as provided in section 11 of this ordinance. And should the amount of said bond be insufficient to cover the cost and charges, he is further authorized and directed to take other proceedings to recover the same.

SEC. 10. The chief of the electrical department shall at all times have free and unobstructed access to the wires, conduits, cables, electrical conductors, or tubes, for the purpose of inspecting the same or making connections therewith for wires or conductors in use or to be used by the city.

SEC. 11. That upon the passage of any ordinance granting any company, corporation, firm, or individual privileges under this ordinance or any ordinance now in force or to be hereafter passed relating to or regulating underground wires, electrical conductors, conduits, cables, pipes, or tubes, the said company, corporation, firm, or individual shall, before exercising any privileges thereunder, give a bond, to be drawn and approved by the city solicitor, and to be entered of record, in the sum of $5,000, conditioned that they will properly relay and pave all openings made by them and thereafter keep in repair (for a period of three years). This ordinance was amended March 29, 1888, by striking out the words "for a period of three years," so as the paving over the openings shall always be kept in repair, and that they will comply with the provisions of section 5 of this ordinance for a like period of three years. And a certificate of such approval shall be furnished by the city solicitor to the board of highway supervisors before a permit shall be issued for the opening of any street or highway for the purpose named, and the company, corporation, firm, or individual to which any privilege is granted shall, before the issuance of a permit, pay $50 to the city treasurer for printing the ordinance granting the privileges asked.

SEC. 12. Should any company, corporation, firm, or individual to which privileges have heretofore been or shall hereafter be granted for the laying of underground wires, electrical conductors, cables, or tubes, dispose of any of the franchises granted by ordinance or lease to, consolidate or merge with any other company, corporation, firm, or individual, they shall forfeit all rights and privileges granted to them by the city of Philadelphia, and upon satisfactory proof being furnished to the chief of the electrical department and the city solicitor, they are hereby authorized and directed to take similar action against the offending company, corporation, firm, or individual as provided for in section 9 of this ordinance.

SEC. 13. All ordinances providing for license charges upon underground wires, electrical conductors, conduits, cables, or tubes, as well as all other ordinances or parts of ordinances inconsistent herewith be, and the same are hereby, repealed.

Under act of Assembly, February 22, 1865, it provides that if any person or persons shall willfully give or cause to be given any false alarm of fire, from a fire-alarm telegraph box or boxes, or shall break or cause to be broken any fire-alarm box or any pole, post, or wire connected with the police and fire-alarm telegraph within the city of Philadelphia, or shall injure or in any manner interfere with or interrupt the working of the same, he, she, or they shall be deemed guilty of a misdemeanor, and, on conviction thereof, shall be punished by a fine not exceeding $500 for each offense, or by imprisonment for a term not exceeding two years, or by both.

CHICAGO.

DESCRIPTION OF ELECTRICAL CONDUITS.

FIRE DEPARTMENT, CITY TELEGRAPH,
Chicago, February 9, 1891.

GENTLEMEN: Your favor of the 22d ultimo, to his honor the mayor, has been handed me for reply. I inclose herewith matter which I think contains all the information at hand. The electrical corporations of this city (I take it that you only desire those operating underground wires) are City of Chicago, Chicago Telephone Company, Western Union Telegraph Company, Postal Telegraph Company, Chicago Arc Light and Power Company.

Yours respectfully,

J. P. BARRETT,
Superintendent.

The ELECTRICAL COMMISSIONERS,
Washington, D. C.

[Circular letter.]

CITY TELEGRAPH DEPARTMENT,
Chicago, January 1, 1890.

DEAR SIR: In order to relieve myself of the necessity of dictating an answer to each inquiry I receive regarding underground wires and electric lighting in this city, below I have compiled all the information at my command on these subjects, and trust that you will find therein the desired information.

The inception of our underground system occurred in 1878. This department erected a new pole route through one of Chicago's select residence districts. The residents strenuously objected to the poles, and a committee of their number waited upon me in reference to the matter. I stated to them that the line might be placed underground, but that the city did not furnish the means for so placing it. They volunteered to defray the expense, and the poles were removed and 840 feet of 2-inch wrought-iron pipe was laid about three feet below the surface and the exterior of the pipe treated with a liberal amount of tar and linseed oil. In this pipe 2 kerite wires were placed. These wires are in service to-day, and are giving as good service as the day they were placed underground; we have never had occasion to touch them; never had a ground, cross, or break on them, and they have not deteriorated to any appreciable extent. From this date on the underground question was agitated, and in 1883 the common council passed an ordinance requiring all electric conductors to be placed underground. In accordance with this ordinance, the various companies doing business in the city, after exhausting all means to evade it, adopted various systems for placing their wires underground, viz: Dorsett conduit, Johnstone conduit, iron pipe, wooden boxes, in which cable was placed and the space between the box and cable filled with bituminous concrete; also conduits of creosoted wood and vitrified sewer pipe. The city took the initial step, and up to the present date have placed underground 20,441 feet of conduit, 474,097 feet of iron pipe, 1,200 feet of wooden trough, 126,443 feet of cable from 5 to 40 conductor, 120 miles of electric-light cable, 65 miles of single wires, 263 manholes, and 168 handholes.

The various companies have placed underground 65 miles of conduit and 5,000 miles of wire. The wire so placed underground embraces all branches of the service, viz: Telegraph, telephone, police, fire alarm, electric lighting, etc. In 1879 I installed a 2-arc light dynamo in the north side waterworks and placed 2 arc lights on the cupola of the waterworks tower, with a view to experimenting with electric lights from an elevated point. This, I think, was the origin of the present tower system now in use in this country, and was the first public electric light operated in the city of Chicago. The first central station plant was installed in 1881 with 40 lights, and that number has increased to date to 6,300 lights, representing an investment of over $2,000,000. All electric light and power wires are subject to a rigid inspection under city ordinance, the inspector being appointed by the superintendent of city telegraph. All electric-light wires are underground. Telegraph, telephone, and electric-light wires are placed in the same conduit. In 1883 a franchise was granted the Sectional Electric Underground Company to build underground conduits for commercial purposes. This company

built about 7 miles conduit in the business district of the city and rent space in same at the rate of $1,000 per mile per duct per year, the city being allowed the use of one duct free of charge.

In 1887 it was decided to install an arc plant for lighting the bridges, viaducts, and the Chicago River. The cable was placed in 2-inch iron pipe and laid under ground between the dock and building line, and divided into four circuits from 3 to 5 miles in length, operating 105 2000-candle arc power lights. The following year a street-lighting plant was installed and consolidated with the original plant, making twelve circuits from 1 to 5½ miles in length. The potential of the original four was from 800 to 1,100 volts; the twelve now in service range from 350 to 1,100 volts. Each conductor carries a current of from 18 to 20 ampères. The appartus used is one of the low-tension pattern. We have in use five different sizes and makes of cable, viz: Patterson, Cobb, Waring, kerite, and okenite. The cables for street-lighting plant were placed in conduits of various kinds, viz: Iron pipe laid in the earth without other protection; iron pipe laid in concrete; iron pipe, cement-lined, laid in concrete; Dorsett conduit, which consists of multitubular blocks of bituminous concrete about 4 feet long.

Manholes are built of brick and placed from 235 to 450 feet apart, of a rectangular shape, averging about 46 inches long by 40 inches wide, and from 4½ to 9 feet deep, with double iron cover, one of which is set below the grade and made watertight by packing, the other set on a level with the street. All the iron pipe was plugged to remove burrs and reamed at the ends. All conduits and pipes are laid with a pitch or difference of grade from 6 inches to 1 foot, so as to drain into the manholes, thus disposing of all drip from condensed moisture. The conduits are practically gas and water tight.

In support of the practicability and safety of underground wires, I desire to submit the following facts:

We have had in service on one of the city telegraph lines for the past twelve years 840 feet of underground wire placed in iron pipe, which has given us excellent service and has not materially deteriorated.

We have had in successful operation for the past two years a circuit about 5 miles in length, carrying a current of 18 ampères at a potential of from 1,000 to 1,100 volts.

We have had in successful operation for the past year 53 miles of electric-light cable, which has given us no trouble. In the various circuits used for the city telegraph, telephone, and electric lighting we have wires and cables made by five different companies, over 6 miles of conduit, manholes, handholes, etc., and have not had a "burn out" or "gas explosion."

In 1887 a company known as the Chicago Arc Light and Power Company was incorporated, and purchased all the plants then operating in the city, and also the franchise of the Sectional Electric Underground Company. This company do commercial lighting exclusively underground, and are successfully working currents at a potential of from 2,500 to 3,000 volts. The longest circuit in use by that company is 7 miles, and is carrying 2,500 volts. Two circuits have been connected by the company, carrying 3,741 volts, and run all night without injury. Encouraged by the success of the street-lighting plant, which was installed last year, it was decided to light the entire city in a similar manner. The city was divided into twelve electric-light districts; each district to have a power station located as near the center as possible; from each power station a main subway to be built extending across the district from boundary line to boundary line, decreasing in duct space from power station towards the boundary line; from these feeder connections are made to the lamps. On all streets where fire or police boxes, engine houses, or police stations are located, enough duct space has been provided to accommodate the underground wires necessary for these departments.

During the past year this department has built 13,838 feet of main subways, some consisting of multitubular blocks of bituminous concrete laid on concrete foundation of Portland cement, sand, and limestone screenings; some consisting of multitubular blocks of bituminous concrete, surrounded on all sides with 3 inches of concrete composed of Portland cement, sand, and limestone screenings; some consisting of wrought-iron cement-lined pipe laid in concrete composed of Portland cement, sand, and granite screenings. Also laid 292,552 feet of 2-inch iron pipe, under sidewalk space for feeders; drew into subways and feeders 66 miles of electric-light cable, erected 366 lamp posts, and built 3 power houses equipped with the necessary machinery and electrical apparatus. Three-fifths of the electrical apparatus is of the high-tension pattern. In contracting for electric-light cables a guaranty was required that the insulation resistance

should not be less than 500 megohms per mile, and that they should not materially deteriorate for the space of two years after being in service on an electric-light circuit having a voltage of from 2,500 to 3,000 volts and a current of from 9 to 12 ampères, or a voltage of from 900 to 1,200 volts and a current of from 18 to 20 ampères; cables placed in conduit by manufacturer. An electric-light post possessing some peculiar advantages has been designed and adopted. It consists of a hollow iron base extending from the sidewalk to a height of 7 feet; a hollow wooden pole extending through the iron base to a height of 9 feet above the iron base, the wooden pole being firmly secured to the top and bottom of the iron post. There are two doors on opposite sides of the iron base, at a height of 5 feet from the sidewalk, and removable panel near the bottom; a frame and hood extending from the top of the wooden pole and having but one standard or support. Inside of one of the doors is placed a wooden box containing a double pole arc-light switch. In the other there is a receptacle for a fire-alarm box. The panel can be removed to facilitate the handling of cables.

The advantages of this pole are many. First and preëminent in importance is the safety it offers to human life, as in case of accident to the lamp the workman can entirely disconnect it from the rest of the circuit without a possibility of contact with the conductor, by throwing the switch near the base of the pole; the wooden pole is a semiinsulator and is much safer to work from than an iron pole, should it be necessary to regulate the lamp while burning. The hollow space between the iron and wooden pole offers a receptacle not only for an electric-light switch and fire-alarm box, where the latter is needed, but if in the future the city should need incandescent lights for city or private use there is room for a converter by which a high-tension current can be changed into a low-tension current for incandescent lighting. The single standard or support for the lamp only gives off one shadow and that can be directed against the part of the nearest building where it will be the least objectionable. We have ventilated our South Side conduit by running a pipe from the mouth of the conduit to the chimney in the city hall. This has proved to be the most practical scheme for ventilating conduits that has come within my experience, and is one that can be readily and cheaply applied in any portion of the city. The lights operated by the city are lit all night every night in the year and cost about 18 or 19 cents per night. I consider it practical to place electric conductors under ground, and think it the only safe place for heavy conductors such as are required for the transmission of light and power. Our experiments with underground wires commenced in the early stages of the art, and up to the present time have been very successful, and I have no hesitation in asserting that we can work them to as high a voltage as would be considered safe on aërial lines. The only objection that can be raised against underground wires, to my mind, is simply the matter of first cost. As an offset to this objection, the service is more reliable, being removed from atmospheric influence or interference, need less repairing, and, consequently, cheaper in the end. I have found this to be true after a long experience with both.

Yours, truly,

J. P. BARRETT,
Superintendent City Telegraph.

CITY OF CHICAGO TELEGRAPH ORDINANCE.

SEC. 2022. No person shall hereafter erect, construct, or put up any telegraph pole, telegraph line, or wire, or electric conductor, in any street, avenue, or alley within the corporate limits of the city of Chicago, under the penalty of $100 for each and every offense; and each and every day every such telegraph pole, line, or wire, or electric conductor, shall be continued and maintained after the first conviction, shall constitute a new and separate offense.

SEC. 2023. No person, company, or corporation to whom permission and authority has heretofore been given to erect and maintain telegraph poles and lines in the streets of the city of Chicago, shall from and after the 1st day of May, 1883, maintain or use any telegraph pole, telegraph line, or wire, or electric conductor, in any street, avenue, or alley in said city, under the penalty of $50 for each and every day such person, company, or corporation shall maintain or use any such telegraph pole, line or wire, or conductor, after said day and year last aforesaid.

SEC. 2024. From and after the 1st day of May, 1883, every telegraph line, or

wire, or electric conductor, used and operated within the corporate limits of the city of Chicago, shall be laid under the streets of said city, and at such depth from the surface, that the necessary excavation incident to laying or repairing the same shall not expose or endanger any water or gas pipes, sewers, or drains, or any parts thereof.

SEC. 2025. Such wires or conductors shall in no case be placed at a greater distance from the curbstone separating sidewalks from carriageway than 4 feet, except in crossing streets running transverse to the direction of the said lines, when such crossing shall be made in the shortest straight line, or in making necessary connections with buildings and stations.

SEC. 2026. The method employed in laying said conductors shall be such that it will at no time be necessary to remove so much of the pavement, or to make such excavation, as to materially impede traffic or passage upon sidewalk or street during operation of laying or repairing said conductors, except when in crossing streets transversely, where it shall be permitted to remove the pavement for a width not exceeding 2 feet in the nearest straight line from corner to corner. In no case during the general hours of passage and traffic shall passage be interrupted thereby for a longer period than one hour.

SEC. 2027. The work of removal and replacement of the pavements in any and all of the streets, avenues, highways, and public places in and through which the wire of any telegraph company shall be laid, shall be subject to the control and supervision of the commissioner of public works. Excavations in any and all of the unpaved streets, avenues, highways, or public places shall also be subject to like control and supervision.

SEC. 2028. The space selected for placing said wires in every case, being limited as to direction and general position by the foregoing provisions, shall not exceed 2 feet in width by 2 feet in depth.

SPECIFICATIONS FOR ELECTRIC LIGHT CABLE.

Sealed proposals will be received at the office of the superintendent of city telegraph until 12 m., Saturday, June 14, 1890, for furnishing the city of Chicago 40 miles, more or less, of electric-light cable as per specification below.

Proposals must be made out upon blanks furnished by the superintendent of city telegraph and be addressed to the city comptroller and indorsed "Proposals for electric-light cable," and be accompanied with $200 in money or a certified check for the same amount on some responsible bank doing business in the city of Chicago and made payable to the city comptroller.

No proposal will be considered unless the party offering it shall furnish evidence satisfactory to the city comptroller of his or their ability, and that he or they have the necessary facilities, together with the necessary pecuniary resources to fulfill the contract and specifications should the contract be awarded to him or them.

The city comptroller reserves the right to reject any or all bids if deemed for the best interests of the city.

Companies or firms bidding will give individual names as well as names of firm with address.

Thirty miles, more or less, of electric-light cable of stranded conductors having a conductivity equal to a solid copper wire with a capacity of 36,000 circular mils and an insulation resistance of not less than 500 megohms per mile.

The bidder to furnish all material, labor, etc., for placing cable in city conduit, making all connections, joints, etc. Each circuit when completed and disconnected from lamps to have an insulation resistance of not less than 500 megohms per mile.

Conduit as described to be furnished, by the city of Chicago, with pull wire through each duct and an insulated switch near the base of each post to which cables are to be connected.

Cables to be in place and ready for service within ninety days from acceptance of bid.

Bidder must furnish sample of cable proposed to be furnished.

Bidder must state thickness of insulation, diameter of cable over all, and the number of cables that can be drawn into a 2-inch, 2½-inch, and 3-inch duct.

Thirty miles, more or less, of electric-light cable of stranded conductors, having a conductivity equal to a pure solid copper wire, with a capacity of 36,000

circular mils, to be delivered within the limits of the city of Chicago, at a point to be designated by the superintendent of city telegraph.

The bidder to furnish a suitable guaranty that such cable shall have an insulation resistance of not less than 500 megohms per mile, after being changed to a reel or reels by the city of Chicago and immersed in water five days, being part of an electric-light circuit having a voltage of from 2,500 to 3,000 volts, and a current of from 9 to 12 ampères, or a voltage of from 900 to 1,200 volts and a current of from 18 to 20 ampères.

Cable must be delivered at a point to be designated, within thirty days from acceptance of bid.

Bidder shall furnish a suitable guaranty that the insulation of the cables furnished shall not materially deteriorate for the space of two years after being in service on an electric-light circuit, having a voltage of from 2,500 to 3,000 volts and a current of from 9 to 12 ampères, or a voltage of from 900 to 1,200 volts and a current of from 18 to 20 ampères.

Cables must be of such diameter over all that not less than two cables can be drawn into a duct measuring 2 inches in the clear, inside measurement, in diameter.

FURTHER DETAILS.

HEADQUARTERS FIRE DEPARTMENT,
CITY TELEGRAPH,
Chicago, March 13, 1891.

GENTLEMEN: I have been unavoidably delayed in answering your favor of the 7th ultimo, as this is my busy season of the year for municipal matters.

With reference to your queries, I will answer them seriatim:

(1) What has been your experience with underground systems?

My experience with underground systems dates from 1878.

(2) What is the degree of proximity in your conduits between telephone, telegraph, and electric-light wires?

In the conduits belonging to the city we have telephone, telegraph, and electric-light wires running parallel in separate ducts. The conductors of the different systems are from an inch to a foot apart.

(3) What, if any, trouble does such proximity delevop?

The only trouble developed by such proximity is from induction, and that only (materially) affects the telephone lines.

(4) Can it be successfully remedied; and, if so, how?

It can be sucessfully remedied by running the outgoing and incoming wires, or positive and negative sides of the electric-light circuits, in the same ducts and using "metallic-circuit" telephone lines, the two sides of the wires twisted in pairs, in cables, such as are now used for underground work by the Chicago Telephone Company and others.

(5) What are the various cables that have been tried to your knowledge, and what is their relative value, both as to insulation, durability, and cost? Please state also the extent of time which they have been tested?

In the municipal service we have used Kerite, Okonite, Patterson, Cobb, Vulcanite, and Standard underground cables. They were laid underground as follows:

Cable.	Amount laid.	Year laid.	Cable.	Amount laid.	Year laid.
TELEGRAPH AND TELEPHONE.			ELECTRIC-LIGHT CABLE.		
Single kerite wire ..... feet..	1,690	1878	Patterson ..... feet..	95,334	1887
Single kerite wire ..... miles..	36½	1884	Kerite ..... do...	52,406	1887
Do ..... do...	29	1885	Cobb vulcanite ..... do...	65,457	1888
Kerite ..... feet..	27,575	1886	Standard underground.. do...	26,420	1888
Do ..... do...	25,942	1887	Okonite ..... do...	26,880	1888
Patterson ..... do...	1,800	1888	Do ..... do...	52,336	1889
Kerite ..... do...	29,792	1888	Kerite ..... do...	58,147	1889
Okonite ..... do...	21,120	1889	Standard underground.. do...	77,340	1889
Patterson ..... do...	8,081	1890	Cobb vulcanite ..... do...	126,611	1889
Standard underground .. do...	8,775	1890	Patterson ..... do...	77,560	1889
Okonite ..... miles..	5	1890	Cobb vulcanite ..... miles..	35	1890
Single Cobb vulcanite.. .. do...	20	1890	Patterson ..... do...	5	1890
			Okonite ..... do...	5	1890

All the above wire and cable has given satisfactory service.

(6) Are alternating high potential currents conveyed through any of your conduits; if so, with what effect upon other conductors?

No.

(7) From your experience, can you give us the relative cost of underground and overhead wires, and their relative efficiency of service?

I can not give accurately the relative cost of underground and overhead wires; so many items are to be considered, such as the number of wires to be laid, natural advantages for underground or aërial distribution, cost of material in different localities making it difficult to make a general comparison. As to the relative efficiency, the advantages are all on the side of underground wires, especially with short lines such as are used for municipal purposes.

(8) If commencing anew, what modifications, if any, would you adopt?

I would profit by past experience in small details, and would build compartments in all manholes, separating the different conductors so they could be handled independently without interfering with others; also preserving them from mechanical injury by employés working in the manholes.

(9) To what extent have your conduits interfered with the public use of the streets?

None.

(10) In the various forms of conduits under your observation to what extent, if any, have they failed, owing to expansion and contraction and to inequalities in alignment or settlement of the sections of the trench or conduit after being laid, and which do you consider the best?

We have not had any serious trouble from expansion or contraction of the pipes or settlement of the trenches or conduits. I do not care to designate one as superior to the other as I consider they all have merit.

(11) Would you advise any special depth for conduits for the purpose of obviating extremes of temperature or mechanical injury?

I would advise laying the pipes of a main conduit designed to accomodate a large number of cables below the frost line.

(12) What is your system of wire distribution for private service, and is it attended with any difficulty? If so, what is your idea of a proper remedy?

We do not have enough private service to give us any trouble; where we have private police or fire-alarm boxes, our service wires are generally laid under the sidewalk inside the area or curb wall and connection is made from them to the building through the basement.

(13) Do you consider the placing of all wires of high and low tension through one subway in the center of the streets or alleys preferable to independent conduits for each class of wires?

If the subway is sufficiently large to permit the placing of the high-tension wires on one side, and the low-tension wires on the other side, also large enough to permit a man to move through it, would favor that kind of a subway; if it can not be built thus large, would favor separate ducts for each class of wires.

(14) In a main subway, do you consider a smaller subway under the sidewalk along or near the curb wall on each side of the street, in view of the facilities for distribution, as preferable to single lines of subway in the central part of the street?

The objection to a small subway under the sidewalk space is that the rapid growth of the industry can not be adequately provided for, therefore prefer a main subway.

(15) Have you had any explosions in manholes, or other parts of your system? If so, state the cause, and your idea of the best remedy.

We had two explosions in manholes owned by the city; one was shortly after the manholes were built and before the wires had been placed therein, and was caused by an accumulation of hydrocarbon gas, which had leaked from a contiguous gas main, and was ignited by a lighted match in the hands of an employé of the city. The other was a year or more after the manhole was built, and was caused by an accumulation of hydrocarbon gas, which had leaked from a contiguous gas main, and was ignited by an employé of the gas company who was looking for an escape of gas in a basement.

As to the remedy, the gas companies should be compelled to confine the gas to the gas pipes. They should not be allowed to manufacture and force gas through rotten pipes and defective joints into electric-light conduits or basements. Stringent rules and regulations are laid down for electric-light companies, compelling them to confine the electric-light current to the electric wires; such rules and regulations should apply equally to a gas company. If this was done the problem of ventilating electric conduits would be very simple. As it is

now I can see no way to avoid explosions in conduits in cities where the earth is saturated with hydrocarbon gas, except by ventilating the conduit, and the ventilation to be thorough must provide for the independent ventilation of each manhole.

(16) Would you advise a specific or general limitation of voltage in electric currents over electric light or motor wires. If so, please give your views and reasons therefor?

Would not put any limit on the voltage carried on underground conductors.

(17) Does the city of Chicago own any electric-light plants? If so, please give us a description of their nature, extent, cost, and cost of maintenance, and relative economy as to light furnished as compared with lights furnished by other corporations?

With a view to lighting the entire city, the city has been laid out into twelve electric-light districts. Each district to have a power station located as near the center as possible. From each power station a main subway to be built extending across the district, from boundary line to boundary line, decreasing in duct space from the power station towards the boundary lines. From these main feeders are run out at right angles to the line of the subway, and extend to the other boundary lines; from these feeders connections are made to the lamps. On all streets where fire and police boxes, engine-house, or police stations are located, enough duct space has been provided to accommodate the underground wires necessary for these departments.

In four of these districts subways have been built, cables laid, power stations erected, lamp-posts set, and are now operating 929 2000-arc lights on different streets of the districts. The power stations are substantial two-story structures of pressed brick and stone, with smokestack 100 feet high from grade, and are designed to accommodate machinery to operate 1,000 arc lights. Each station is equipped with automatic high-speed engines to which the dynamos are belted direct, tubular boiler fitted with mechanical and smokeless furnaces.

The systems used are Thomson Houston, Brush and Western Electric. The system has given entire satisfaction. I can not make a fair comparison at this time, as we are operating our lights at a disadvantage, owing to the fact that we are lighting only a portion of the several districts, and the proportionate cost is greater than if all of one or more than one district could be entirely lighted, as the land, buildings, and subways must be provided for the entire district and only a portion of them used.

(18) In the light of your experience, what are your views as to the ownership and control of electric light, telegraph, and telephone conduits?

The ownership should be in the municipality.

Yours respectfully,

J. P. BARRETT,
Superintendent.

MUNICIPAL REGULATIONS.

Sealed proposals will be received at the office of the fire marshal until 12 o'clock noon, Tuesday, October 22, 1889, for furnishing all material, labor, and constructing, exclusive of excavations, filling and paving, subway for electric conductors, one mile, more or less, in length.

SPECIFICATIONS.

Excavations, refilling and paving to be done by the city of Chicago.

Conduit or subway, with capacity for forty-eight three-quarter inch cables, to be laid on Throop street, commencing at a point about 150 feet south of Van Buren street; thence south to Harrison street; thence east on Harrison street to Sangamon street, 3,000 feet, more or less.

Conduit or subway, with capacity for thirty-six three-quarter inch cables, to be laid on Harrison street, commencing at the intersection of Sangamon street; thence east to Desplaines street; thence north on Desplaines street to Van Buren street, 3,000 feet, more or less.

Manholes, twenty, more or less. Sewer brick, 12-inch walls laid in English Portland cement, composed of 1 part cement and 3 parts sand. Walls to be well plastered outside; 64 inches inside diameter (clear); 84 inches from street level to floor; 8-inch concrete floor; substantial cast-iron collars and covers.

Bidders must describe specifically the conduit or subway they propose to furnish, also detail drawing of same.

Bidder must furnish sample of material to be used, describing manner of laying, making joints, etc.

Bidders must state any special features or merits claimed for their conduit or subway.

The fire marshal reserves the right to reject any or all bids or to award the contract to one bidder for the whole work, or to award the same separately, as he may deem for the best interests of the city.

Conduit or subway shall be fully completed thirty days from acceptance of bid.

SPECIMEN OF NOTICE TO CONSUMERS.

HEADQUARTERS CITY TELEGRAPH,
SUPERINTENDENT'S OFFICE,
Chicago, ———, *189—*

To M ———:

You are hereby notified as consumer of electric light at ——— to submit the same for inspection under penalty imposed by the following ordinance, approved December 13, 1883, amended April 9, 1884, to wit:

Be it ordained by the Common Council of the City of Chicago:

SECTION 1. No electric-light lamps shall be used for lighting any building, or portion thereof, in this city, by electricity, unless a certificate of inspection shall be first procured from the superintendent of the city telegraph.

SEC. 2. In addition to the duties now required of him, the said superintendent shall have power, and, on proper application, it shall be his duty to inspect any wires placed in buildings in this city, and used or designed to be used therein as conductors of electricity, for the purpose of lighting the same or any portion thereof, by making a careful examination of such wires, and of their insulation and location, and if the same be approved by him, he shall make and deliver to the person for whom the inspection was made, upon payment of the fees hereinafter mentioned, a certificate of such inspection, which shall contain the date of inspection and a general description of the result of such examination, but no certificate shall be made or granted, unless each electric-light plant shall present the following requirements: All wires used in connecting lamps, generators, and other necessary appliances, must have a conductivity at least equal to No. 6 copper wire (American gauge) except branch wires leading to incandescent lamps, which may have one-tenth the above conductivity, provided some approved automatic device is introduced into the circuit that will interrupt any excess of current passing into said branch circuits. Continuous wire to be used as far as possible, and when necessary to make joints they must be made in a manner to insure perfect and durable contact.

All wires must be insulated and covered with a noninflammable material, and where running along walls and ceilings must be fastened on solid insulation in such a manner as to leave the wires at least one-half inch from said wall or ceiling. Generators, lamps, and other appliances must be so mounted and secured as to be completely and continuously insulated from the ground. Electric light circuit, with generator and lamps connected and placed in position, must show an insulation resistance between the ground of not less than 1 megohm. Ground circuit will not be permitted. All wires must be separated from each other by a distance of at least 1 foot for arc lights, and 2½ inches for incandescent lights. Branch wires leading to incandescent lamps may be grouped when required, provided, that only positive or negative wire enter the same group. Whenever wires are connected through walls, floors, or partitions, or cross one another, they must be surrounded by a solid insulating substance. Exposed portions of generators and lamps must be protected by appropriate screens so as to prevent accidental contact with exterior objects. Arc lights must be protected by glass globes, inclosed at the bottom so as to prevent the fall of ignited particles; in show windows or other places where inflammable materials are near the lights, spark arresters must be placed at the top of the globes, and such other or different requirements as shall be at least equivalent in safety to those above mentioned.

SEC. 3. Requires the payment of a fee, by the party requiring the inspection, of $1 per horse power used, for each inspection made.

SEC. 4. Provides for the keeping of the records of such inspection.

SEC. 5. No alteration shall be made in the plant after inspection without first notifying the city electrician, and subjecting the plant to inspection, subject to the provision of the ordinance.

SEC. 6. Any person who shall use any electric-light lamps in violation of any of the provisions of this ordinance, shall be subject to a penalty of not less than $50 nor exceeding $100, and to a like penalty for each day during which he shall continue such violation.

By order of the

SUPERINTENDENT OF CITY TELEGRAPH.

BOSTON.

LETTER FROM THE CHIEF INSPECTOR OF WIRES.

DEPARTMENT FOR THE INSPECTION OF WIRES,
OFFICE OF INSPECTOR, 28 SCHOOL STREET, ROOM 48,
Boston, April 4, 1891.

GENTLEMEN: I have had the honor to have referred to me your letter of January 21 to the mayor, concerning the matter of electric wires, conduits, etc., in Boston, and in reply would say that:

(1) This city has had no practical experience in their control beyond the restrictions imposed upon the various corporations by the city council, in placing their poles and opening streets for conduits, which have been substantially to the effect that no poles shall be placed in the streets within the city limits, nor openings made for conduits, unless application for permission so to do, accompanied by a plan to be deposited in the office of the department of streets, shall be first submitted to the board of alderman and favorably acted upon by that body in each instance.

By an act of the State legislature (Acts and Resolves of the Legislature of Massachusetts, session of 1890, chap. 404) it was made mandatory upon the city to appoint an officer to supervise all electric wires; in compliance with which an ordinance was passed in the latter part of the year creating a department for the inspection of wires. Your attention is respectfully called to inclosed copy of chapter 8 of this ordinance, which giver in detail the duties of the inspector, but owing to the fact that the department has not yet been fully organized, and that the matter of amending the ordinance so as to more especially define the duties and authority of the inspector is now pending, there has not yet been sufficient experience in active operations in this direction upon which to make a report at this time.

(2) The following is a list of electrical corporations in this city, showing the number of miles of conduits now in service:

	Miles conduits.
Western Union Telegraph Company	1.9
New England Telephone and Telegraph Company	16.3
Edison Electric Illuminating Company	37.0
Boston Electric Light Company.	
Commercial Cable Company.	
Postal Telegraph Company.	
Brookline Gas Light Company.	
Charlestown Gas Light Company.	
West End Street Railway Company.	
Electric Protective Association	55.2
Holmes Electric Protective Company.	
Mutual District Messenger Company.	
Pulsion Telephone Company.	
Walworth Light and Power Company.	
Automatic Fire Alarm and Extinguisher Company.	
United States Electric Fire Signal Company.	
Boston Auxiliary Fire Alarm Company.	
Total miles conduit	55.2

(3) The only approach to a high-potential current in underground service is the 200-volt current of the Edison Electric Illuminating Company, the wires for which are laid in a conduit by themselves.

The conduits owned by the other companies contain only their own wires at present, although the city has reserved rights in them for placing the wires of the fire-alarm system, but has not availed itself of the privilege up to the present time. The recent action of the State legislature and city council was taken for the purpose of procuring a systematic and effective supervision of the whole matter of electric service in the city, and by the creation of this department it is expected to obtain the desired result.

Respectfully submitted.

B. S. FLANDERS,
Inspector of Wires.

THE BOARD OF ELECTRICAL COMMISSIONERS,
Washington, D. C.

ORDINANCES OF 1890 CONCERNING ELECTRIC WIRES.

CHAPTER 8.

Be it ordained by the city council of Boston, as follows:

SECTION 1. A department of the city, to be known as the "department for the inspection of wires," and to be under the charge of an inspector of wires, is hereby created. Said inspector shall be appointed by the mayor, subject to confirmation by the board of aldermen, for the term of one year, beginning with the 1st day of May in the year of his appointment and until his successor is appointed and confirmed, and shall be paid an annual salary at the rate of $3,500 a year.

SECTION 2. Said inspector shall supervise every wire or cable over streets or buildings, and every wire within a building when such wire is designed to carry an electric light or power current; shall notify the person or corporation owning or operating any such wire or cable whenever its attachments, insulation, supports, or appliances are unsuitable or unsafe, or any tags or marks thereof hereinafter described are insufficient or illegible; and shall remove every wire abandoned for use, and every wire except the wire of a street-railway company used for the transmission of its motive power, or for the protection or support of such wires, which, after the expiration of six months from the date of his appointment, shall be unprovided with a tag or mark distinctly designating the owner or user of such wire or cable; shall see that all statutes, ordinances, and regulations relating to his duties, and to the location, erection, supports, maintenance, insulation, and removal of wires or cables in, over, or under streets or buildings are strictly complied with and enforced.

SECTION 3. Said inspector shall, as soon as convenient after his appointment, make and thereafter keep in his office a map showing the location of all wires over, in, or laid under the streets and other public places; and over buildings of the said city, and a record of the names of the owner or owners of each and all said wires.

SECTION 4. Said inspector shall, when so required by the mayor or aldermen, examine every application for the erection of any wire, or poles or posts for the support thereof, in or over any street or public place, or for conduits under any street or public place for such wire, and shall report to them any facts which in his opinion bear upon the question of granting or refusing to grant such application.

SECTION 5. Said inspector shall have the charge and control of the erection and maintenance of all wires owned by the city, including the fire-alarm telegraph and police electric signal and telephonic systems, and of the posts and other supports therefor now erected or owned or hereafter erected by the city. He shall purchase and set up all the wires, posts, supports, and all the dynamos, machinery, and other electrical appliances required by the city in all departments, and shall see that all the said wires, posts, machinery, and appliances are maintained and kept at all times in good order and condition.

BUFFALO.

LETTER FROM THE MAYOR.

MAYOR'S OFFICE,
Buffalo, N. Y., January 28, 1891.

TLEMEN: I inclose you herewith a copy of the ordinances of the city of o relating to wires of electrical corporations as you requested.
uffalo the electric-light corporations have been compelled to comply with dinance, and have built their own conduits. The city has police and fire- wires placed underground. They are placed in iron tubes at a depth of 2 feet.
high potential circuits are in conduits separate from the telephone and aph circuits.
electrical corporations doing business in Buffalo, aside from the Western Telegraph Company and the Bell Telephone Company, are the Brush ic Light Company, the Thomson-Houston Electric Light and Power Com- and the United States Electric Light Company.
further information I may be able to give you will be furnished at any ou desire it.
Respectfully,

CHAS. F. BISHOP, *Mayor.*

ELECTRICAL COMMISSIONERS,
District of Columbia.

ORDINANCES CONCERNING ELECTRIC WIRES.

city of Buffalo, by its common council, does hereby ordain and enact as s:

CHAPTER 42.

ELECTRICAL WIRES.

TION 1. The telegraph, telephone, and electric-light wires and cables, and ier appliances for conducting electricity, and the poles therefor, heretofore d and now being in any street, alley, or public ground of the city are hereby d removed from overhead in all such streets, alleys, and public grounds a six months from and after the enactment of this ordinance, and any com- corporation, or individual owning or controlling any such overhead wires, , or appliances that neglects or refuses to remove them from overhead a the time and as hereinbefore provided, shall forfeit and pay a penalty of or each and every offense; and if any such wires, cables, or appliances shall ue and remain overhead for five days after notice by the chief engineer or sistant engineer of the fire department to the owner or owners thereof or person, corporation, or company controlling the same, such owner or own- , or individual, company, or corporation controlling any, such wires, cables pliances so remaining overhead shall be subject to a penalty of $100 for week after such five days specified in said notice during which such wires, , or appliances shall remain overhead.
2. The common council shall grant permission to any company, corpora- or individual to place its wires and electrical conductors in conduits under rface of the streets, alleys, or public grounds of the city; any such individ- rporation, or company desiring such permission shall petition the council for; such petition shall name the streets, alleys, and public grounds and the nd portions thereof to be used and occupied by such conduits and shall fur- nd submit a map thereof to accompany such petition. Such permission be granted by the common council upon the conditions that the petitioner furnish a bond to the city, to be approved by the mayor and in the penalty prescribed by such permission, that the pavement of the streets, alleys, and grounds wherein such conduits are laid shall be properly replaced, and he city shall be saved harmless from any and all damages arising from lay-

ing such conduits; that such conduits shall be of sufficient capacity to accommodate the wires of such petitioner and any other electrical wires on such streets, alleys, or public grounds and to provide for an increase thereof to at least the extent of 50 per cent; that the wires of the city shall be carried in such conduits free of charge; that the owners of such other wires may occupy such conduits upon such terms as may be agreed upon with the petitioner, and in case of a disagreement, upon terms to be determined by arbitration; any such company, corporation, or individual so placing its wires underground in any street, alley, or public ground of said city shall, upon notice from the city or any of its departments that a local improvement or sewer or water main or branch thereof is to be constructed in such manner as will necessitate the moving or altering of its conduit or conduits of said individual, company, or corporation, move or alter the same at its own expense so as to permit the construction of the improvement where ordered, and should any company or corporation omit to comply with such notice, the conduit or conduits may be altered or moved by the city and the cost and expense thereof recovered from such individual, company, or corporation.

SEC. 3. No individual, company, or corporation shall be allowed to erect or maintain wires, cables, or poles therefor, or electrical appliances of any kind, in the city of Buffalo overhead without the permission of the common council so to do.

BROOKLYN.

LETTER FROM MR. NORTHUP.

COMMISSIONER'S OFFICE, DEPARTMENT OF CITY WORKS,
Brooklyn, N. Y., February 3, 1891.

GENTLEMEN: Your letter to his honor Alfred C. Chapin, mayor of the city of Brooklyn, has been referred to this department for investigation and reply.

I herewith transmit for your information the law of the State of New York, passed 1885, bearing upon this subject, premising, however, that in the year 1884 (prior to the passage of the act of 1885) a short and sweeping law was passed by the State legislature directing all wires in cities of certain number of inhabitants to be placed underground on or before the 1st day of September of said year. I also send to you copy of a letter prepared for me and addressed to the deputy commissioner of this department relative to matters asked for. If there are any further questions to ask in connection with the subject of electrical matters in this city not fully answered under the law and in the communication of the telephone company, please state the fact and they shall have prompt attention.

Respectfully,

D. L. NORTHUP.

The ELECTRICAL COMMISSIONERS,
Washington, D. C.

LETTER FROM MR. SARGENT.

GENERAL OFFICES NEW YORK AND
NEW JERSEY TELEPHONE COMPANY,
Brooklyn, N. Y., February 2, 1891.

DEAR SIR: Referring to the inquiries received from the electrical commissioners of Washington, D. C., I send you herewith copy of the underground law and final report of the commissioners of electrical subways of Brooklyn.

Replying to the first inquiry: The conduits or subways in the city of Brooklyn were constructed under the general supervision of the subway commissioners appointed by the mayor, but they were built and are owned by the telephone and telegraph companies, who occupy them jointly. This arrangement has been entirely satisfactory, and the result is that there are now 6,000 miles of wire underground in the city of Brooklyn.

Replying to the second inquiry: The subway commissioners of Brooklyn did not approve of the conduits being used jointly by telephone and telegraph companies and electric light or power companies. The only electric light wires underground in Brooklyn are those of the Edison Electric Illuminating Company. These are laid on the opposite side of the street from the telephone and telegraph conduits.

Please let me know if I can be of any further aid in answering these inquiries.

Very truly yours,

W. D. SARGENT.

JAMES A. MURTHA, Esq.,
Deputy Commissioner Public Works, Brooklyn.

GENERAL LAWS OF THE STATE OF NEW YORK FOR PLACING ELECTRICAL CONDUCTORS UNDERGROUND.

CHAPTER 499.

AN ACT providing for placing electrical conductors underground in cities of this State and for commissioners of electrical subways. Passed June 13, 1885; three-fifths being present.

The people of the State of New York, represented in senate and assembly, do enact as follows:

SECTION 1. Within twenty days after the passage of this act, in any city of this State having, according to the last census, a population exceeding 500,000 and less than 1,000,000, the mayor of such city is hereby authorized and directed to appoint, and in cities having a population exceeding 1,000,000, the mayor, the comptroller, and commissioner of public works of such cities are hereby authorized and directed to appoint three disinterested persons, residents of the respective cities for which they shall be appointed, to be a board of commissioners of electrical subways. Such board shall meet as soon as practicable after such appointment, and shall then organize by the election from their number of a president and a secretary of the board. The board shall give at least ten days' notice, in a daily paper published in such city, of the time and place of such meeting.

SEC. 2. The said board of commissioners is hereby charged with the responsibility of enforcing the provisions of an act entitled "An Act in relation to the telegraph and electric-light companies in cities of this State," passed June 14, 1884, as amended; and the said act is hereby amended and made to conform in all respects to the provisions of this act, and it is hereby made the duty of said board of commissioners to cause to be removed from the surface and put, maintained, and operated underground, wherever practicable, all electrical wires or cables used or to be used in the business of any such company in any street, avenue or other highway in any such city, so as to enable and require all duly authorized companies operating or intending to operate electrical conductors in any street, avenue, or highway of any such city, as is or shall be affected by the provisions of said act, to transact their business with underground conductors wherever practicable.

SEC. 3. When any company, operating or intending to operate electrical conductors in any such city, shall desire or be required to place its conductors or any of them underground in any of the streets, avenues, or other highways of any such city, and for that purpose to remove the same from the surface thereof, and shall have been duly authorized to do so, it shall be obligatory upon such company to file with said board of commissioners a map or maps, made to scale, showing the streets or avenues or other highways which are desired to be used for such purpose, and giving the general location, dimensions, and course of the underground conduits desired to be constructed. Before any such conduits shall be constructed, it shall be necessary to obtain the approval by said board of said plan of construction so proposed by such company; and said board has and shall have power to require that the work of removal and of constructing every such system of underground conductors shall be done according to such plan so approved, subject at all times to such modifications as shall from time to time by the board be made, and subject also to the rules and regulations not inconsistent herewith, prescribed or to be prescribed by the local authorities having control of such streets, avenues, or other highways of such city.

SEC. 4. It shall be the duty of said board of commissioners to carefully investigate any and all methods proposed by any such company for electric lighting or electrical communication by the use of conductors along or across any street, avenue, or other highway in any such city; and, before approving of any such method, said board of commissioners shall require that, so far as practicable, all such conductors, when constructed, shall be underground; provided no suitable plan is proposed or in use within sixty days after the passage of this act, it shall be the duty of such board to cause to be devised and made ready for use such a general plan as will meet the requirements of said act and of this act, and the board shall have full authority to compel all companies operating electric wires to use such subway so prepared in accordance with the provisions of this act. Wherever in the suburbs or along the streets, avenues, or other highways in sparsely inhabited or unoccupied portions of any such city, the public interest do not require the electrical conductors to be placed underground; and wherever in any other locality of any such city, it is deemed by said board to be for any cause impracticable to construct and successfully operate underground the electrical conductors required by any such company; then, and in either of those cases, it shall be the duty of said board of commissioners to examine and grant the application of any such company for permission to deviate there from an underground system; but the board shall not grant any such permission unless the board shall be satisfied, upon investigation, that such a permit should, and for one or the other of the reasons hereinbefore stated, be in such case granted, and that it will not interfere with the successful working of underground conductors elsewhere in such city. Any such permit shall be held and construed to authorize the construction and maintenance of the lines of conductors therein provided for, as and where prescribed by the board. It is hereby made the duty of said board of commissioners, in granting any such permit for other than underground electrical connections, to bear in mind the policy and purpose of this act, which is to convert the overhead systems of electrical wires and cables now in use in said cities to underground systems as soon as possible without impairing the efficiency of their service, to require that as far as practicable, all electrical conductors in any street, avenue, or other highway of any such city shall be removed from the surface and placed and operated underground, as soon as may be consistent with the convenient use thereof by the public: and that it is intended hereby to authorize other than underground electrical conductors, to be used in the streets, avenues, or other highways of any such city only when and where the public interests do not require the electrical conductors to be placed underground, or when and where it shall be deemed by the board itself to be impracticable to place and operate the conductors advantageously underground as aforesaid; and that it is hereby intended to make all aërial or other electrical connections incidental only to such underground methods, and to require that they be authorized only when and where needed for the convenient use of the public, or where the underground conductors can be made thereby more useful. The work of constructing every line of conductors authorized by any such permit so granted shall be subject to the rules and regulations, not inconsistent herewith, prescribed or to be prescribed by the local authorities having control of such streets, avenues, and other highways in such city; every such permit shall specify the location of the structures to be erected and to be used for sustaining the electrical conductors, and shall give the general dimensions thereof; and a copy of every such permit shall be filed by said board of commissioners in the office of the mayor of such city to which it relates, and shall be recorded there in a book to be provided and kept for that purpose, which shall be at all times accessible to the public. It shall be the duty of such boards in devising the aforesaid plan so to devise the same that the subway may be used by any such city for the electric wires or conductors operated by its police, fire, or other departments without expense, except the expense of the wires or conductors, but no such city shall be compelled to place any such wires or conductors underground until the money has been specifically raised therefor by the proper authorities, and until that time any such city may continue to use and extend such wires in the same manner as though this act and the act referred to in the second section of this act had not been passed.

SEC. 5. Whenever said board of commissioners, in carrying out the provisions of said act, shall permit any aërial electrical wires or cables to be carried along or across and above the surface of any of the streets, avenues, or other highways of any such city to be crossed by aërial electrical wires or cables, it shall be the duty of the board to designate also, in such permit, the route and location thereof, and to prescribe and regulate the height at which such wires and cables shall be

l; and it is hereby expressly provided that when any such permit shall be ɔd by said board of commissioners, in extending the connections of any sub- ɪean electrical conductors for the erection of any structure or structures for ning electrical conductors above the surface of any highway, or for placing or cables on any such structure or elsewhere than underground, or for ng any such wires or cables across or along and above the surface of any ay, or for placing wires or cables on any such structure or elsewhere than ground, or for carrying any such wires or cables across or along or above rface of any highway, or over or into or in the rear of any building or block r such city, any and all such structures, and any and all such wires or , shall be so erected and maintained as not to incommode the other public f such streets, avenues, or other highways.

. 6. The term of office of said commissioners shall expire on the 1st day of nber 1887, or sooner upon the performance of their functions, as herein ibed. Each of the commissioners so to be appointed, and each of his suc- s in office, is and shall be removable for cause, but only upon notice and an opportunity to be heard by the governor of this State, who has and ıave power to fill any and all vacancies, however caused, in the office of of the commissioners hereabove named.

. 7. The salary of each of said commissioners and of every successor of of them, if appointed for either of such cities having a population of more ,000,000, shall be $5,000 per annum, and if appointed for either of such having a population of less than 1,000,000, shall be $3,000 per annum, pay- uarterly by the comptroller of this State, who shall also audit and pay ɛrly all necessary and incidental expenses of each of such board of commis- s. The amount of such salaries and expenses shall be by the comptroller ed upon and collected from the several companies operating electrical con- rs in any such city of the State, which under the provisions of said act are ll be required to place and operate any of their conductors underground, ıe amount of any such assessment shall be paid by the company upon which ɔ assessed to the comptroller in installments, quarterly or oftener, as and required by him.

. 8. It shall be the duty of every such company to furnish the comptroller ime to time, as and when requested, all data by him desired to enable him ortion the relative share to be paid by each such company of the expenses l board and of the salaries of said commissioners, such estimate to be by the troller made with reference to the number of miles of wires operated within mits of any such city, and the several companies interested to be by the troller assessed ratably according to the number of miles of such wires ı the comptroller shall certify to be operated by them respectively.

. 9. All maps, books, and papers of said board of commissioners relative to ical conductors in any such city shall, at the expiration of the term of office h commissioners, be filed in the office of the mayor of such city, and shall ɜre kept at all times accessible to the public.

. 10. All acts and parts of acts inconsistent herewith are hereby repealed.

. 11. This act shall take effect immediately.

CHAPTER 534.

T in relation to telegraph and electric-light companies in cities of this State. Passed June 14, 1884; three-fifths being present.

ople of the State of New York, represented in senate and assembly, do enact as follows:

TION 1. All telegraph, telephonic and electric-light wires and cables used in ncorporated city of this State, having a population of 500,000 or over, shall fter be placed under the surface of the streets, lanes, and avenues of said

. 2. Every corporation, association, or person owning or controlling tele- ı, telephonic, electric, or other wires and cables, including what is known ɜgraph poles, and other appurtenances thereto shall before the 1st day of nber, 1885, have the same removed from the surface of all streets or ave- in every such city of this State.

. 3. In case the owners of the property above enumerated shall fail to com- ith the provisions of this act within the time herein specified and limited,

the "local governments" of the said cities of this State shall then, and they a hereby directed to remove without delay all telegraph, electric-light, and st other wires, cables, and poles, wherever found above ground within the cor rate limits of their respective cities.

SEC. 4. No city in this State shall grant any exclusive privilege or franch under this act to any corporation or individual by which a monopoly may be c ated or competition prevented on equal terms.

SEC. 5. This act shall take effect immediately.

PITTSBURG.

LETTER FROM MR. MEAD, SUPERINTENDENT BUREAU ELECTRICITY.

DEPARTMENT OF PUBLIC SAFETY, BUREAU OF ELECTRICITY,
Pittsburg, Pa., January 28, 189

GENTLEMEN: Your communication of the 22d instant, asking for certain el trical information, has been handed me by the mayor of the city to reply to.

The only attempt at municipal control of electric companies in this city i electric railway companies, and the inclosed blanks will give you an idea of extent of that control.

They report weekly, and we make our own private tests at irregular interv

Of course, the city has the usual complete fire alarm and police telegraph s tems; also a control of all telephones in department use, about two hundred fifty, which they keep in repair, as well as run the wire for their use, etc.

The city has no underground service for its own wires worth speaking of; twelve wires for 650 feet is all.

The telephone company have a great deal of underground service; just h much I can not say. The Western Union Telegraph and Postal Telegraph C panies also have some underground, and Electric Light Company some, but e operates under separate ordinances and use their own methods.

There are no conduits in use which are used jointly by any two compan each has its own system. Usually it is a system of lead-covered cables, laid tar, surrounded by small wooden boxes.

Would be pleased to receive a copy of your report when it is printed.

Very respectfully,

MORRIS W. MEAD,
Superintendent Bureau of Electricit

SAN FRANCISCO.

LETTER FROM THE MAYOR.

MAYOR'S OFFICE, CITY AND COUNTY OF SAN FRANCISCO,
San Francisco, February 14, 189

GENTLEMEN: Yours of January 23 was inadvertently pigeon-holed, hence delay in answering. I send to you to-day a copy of the general orders of board of supervisors, which will give you all the laws and regulations conce ing electric wires, conduits, etc. The telephone company has the only franch from the city for underground conduits under ordinance No. 2186, which I s with the copy of general orders. The telephone company has 8,823 feet of derground conduits laid down, with a capacity of 53,000 feet of cable. In ad tion to above, about 15,000 feet of underground conduit, with a capacity of 90, feet of cables, will be laid in the next ninety days. The following compan are doing business in San Francisco: Electric Supply Company, Bush stre Electrical Development Company, No. 323 Pine street; Electric Improvem Company, No. 35 New Montgomery street; Electrical Construction and Main nance Company, No. 35 Market street; Electrical Works, No. 35 Market stre

Electric Light Company, 227 Stevenson street; Electric Light and Power Company, southwest corner of Anne and Stevenson streets; West Coast Electric Light Company, 411½ California street.

Trusting that this is the information which you desire, I am,

Very respectfully, yours,

GEO. R. SANDERSON,
For the Mayor.

The ELECTRICAL COMMISSIONERS,
Washington, D. C.

BALTIMORE.

LETTER FROM THE MAYOR.

MAYOR'S OFFICE,
Baltimore, January 27, 1891.

GENTLEMEN: In reply to yours of the 22d I beg to say that our last legislature passed a law giving the municipal authorities control of the highways, and I have recommended in my message to the city council that authority be given the executive officers of this city to require all wires of every kind to be placed underground within a reasonable time. They are unquestionably a nuisance, in that they are a serious detriment to the operation of fire apparatus, as well as dangerous to life, and a great interference with the beauty of the city.

I give you the following extract from the report of the chief engineer of the fire department concerning the conduits now being laid by the Chesapeake and Potomac Telephone Company. (This report is now in the printer's hands.)

"In the ordinance granting the Chesapeake and Potomac Telephone Company the use of the streets, the city reserved the right to place the wires of the police and fire alarm telegraph in said trenches or conduits.

"58,977 feet of trench or conduit are now ready for occupancy, containing 734,000 feet of duct for cables.

"In these conduits 140,000 feet of cable have already been drawn, each cable containing from 50 to 100 wires.

"75,000 feet more cable will be added, making the grand total about 215,000 feet."

This city has had no experience with underground wires, as yet, the Chesapeake and Potomac Telephone Company being the first to adopt this system, and they have not yet commenced to use the same.

Whenever this office can be of service to you we will be glad to have you call upon us.

Yours, very respectfully,

ROBERT C. DAVIDSON,
Mayor.

The ELECTRICAL COMMISSIONERS,
Washington, D. C.

ST. LOUIS.

LETTER FROM MR. REILLY, SUPERVISOR OF CITY LIGHTING.

OFFICE OF THE SUPERVISOR OF CITY LIGHTING,
St. Louis, January 29, 1891.

GENTLEMEN: Your letter of January 23, to the mayor of St. Louis, has been referred to me for reply.

There is 1 mile of Dorsett conduit in this city, but it is not used; all wires are overhead. There are two bills in the municipal assembly to place wires underground, one for Bell Telephone Company and the other for the Postal Telegraph Company. They are to exclude all wires except those of the company owning the conduit.

I inclose copies of all ordinances on the subject of telegraph, telephone, and electric-light wires and poles that are in force in this city.

Very respectfully,

A. J. W. REILLY,
Supervisor of City Lighting.

The BOARD OF ELECTRICAL COMMISSIONERS,
Washington, D. C.

NEW ORLEANS.

LETTER FROM THE MAYOR.

MAYORALITY OF NEW ORLEANS,
City Hall, January 20, 1891.

GENTLEMEN: Replying to your letter of inquiry of January 23, on the subject of municipal control of electric wires, conduits, etc., I hand you, by direction of the mayor, copies of all our ordinances on the subject. The practice here is to convey currents of all kinds on overhead wires. It will be seen that safety to life and property has been little considered.

I hand you also an ordinance which was by the mayor, city engineer, board of underwriters and the general public deemed necessary, but which the council refused to pass.

Respectfully,

WRIGHT SCHANNLERY,
Secretary to the Mayor.

FALL RIVER.

LETTER FROM THE MAYOR.

CITY OF FALL RIVER, MAYOR'S OFFICE,
January 28, 1891.

GENTLEMEN: In reply to yours of January 23, containing inquiries relative to the municipal control of electric wires, will say that the city of Fall River has no control whatever over any wires with the exception of those used for the fire-alarm and the police-signal service.

With regard to the laws and regulations pertaining to the wires, I have mailed you this day a copy of the mayor's address, in which you will find reference to the subject.

There are some poles used by the city for fire-alarm purposes which are owned by the telephone company.

Our electric-light companies are the Fall River Electric Light Company and the Edison Illuminating Company. The former company has wires suspended on poles owned by the company. In the central portion of the city the Edison Illuminating Company employ conduits.

Truly, yours,

JNO. W. COUGHLIN, *Mayor.*

SAULT STE. MARIE.

LETTER FROM THE MAYOR.

MAYOR'S OFFICE,
Sault Ste. Marie, Mich., January 27, 1891.

GENTLEMEN: Our city owns poles in business portion, a row on each side of street, 60 feet high, poles opposite each other; all electric wires required to be strung thereon. We have Sault Edison Light and Power Company, using Edison and Thomson-Houston systems; Sault Electric Railway, using separate plant and distinct wires; Bell Telephone Company, and Western Union and Canadian Pacific Telegraph Company.

The city was compelled to assume control of poles to avoid a forest of miscellaneous sticks. Main objection is impediment offered to fire department.

Respectfully, yours,

OTTO FOWLE, *Mayor.*

DENVER.

LETTER FROM THE MAYOR.

MAYOR'S OFFICE,
Denver, Colo., January 26, 1891.

GENTLEMEN: In reply to yours of the 23d will say that we have not taken any special action on the subject of underground wires. We have a number of overhead electric railways as well as numerous telegraph companies, and also overhead wires for the telephone system and also the police patrol and fire department wires.

The telephone company have been granted a franchise for an underground system and have placed all of their wires underground in the business streets in the center of the city and it has improved their service very much. The police patrol and fire department have the right to use these conduits free and we will this year put such wires in the conduits as far as constructed and as far as it is practicable for those departments to do so.

This is about all we can tell you about the subject as relating to Denver.

Very truly,

WOLFE LANDONER, *Mayor.*

The two departments named will spend about $15,000.

The ELECTRICAL COMMISSIONERS,
Washington, D. C.

TORONTO.

LETTER FROM THE CITY ENGINEER.

The following is a copy of a letter received from the city engineer of Toronto, in answer to a communication addressed to him by the mayor of that city:

CITY ENGINEER'S DEPARTMENT,
Toronto, January 30, 1891.

DEAR SIR: With reference to yours of the 26th, with communication from the electrical commission of Washington in regard to conduits, etc., I wish to state that very little work of this nature has been done in Toronto, the companies who have their wires underground (the Bell Telephone Company partially and the Toronto Incandescent Electric Light Company wholly) each having a separate conduit for their use.

As you are aware, however, it is proposed by me that tunnels shall be constructed along the streets for the reception of water and gas pipes as well as electric conduits. These tunnels will, of course, be very expensive in the first instance; but I think that in the business sections of the city they will prove more economical in the end than the present mode of permitting each company to lay down its separate service.

The only objection of the electric companies to the general use of one tunnel is that high and low tension services can not be carried on successfully in it. This, however, I am inclined to think, will very shortly be overcome by the use of thoroughly insulated wires laid in properly constructed tubes or conduits.

I inclose blue-prints setting forth proposed conduits, and, if you have no objection, will keep the communication from the electrical commissioners for file with other electrical papers.

I remain, sir, yours respectfully,

WM. T. JENNINGS,
City Engineer.

E. F. CLARKE, Esq.,
Mayor of Toronto.

Cost of electric lighting under municipal ownership.

ARC LAMPS.

City.	Total cost of plant, including buildings.	Yearly expenses									
		Interest and depreciation at 16 per cent.	Taxes and insurance.	Superintendence and labor.	Fuel.			Carbons.	Repairs.	Sundries.	Total.
					Kind.	Price per ton, cord, etc.	Cost.				
Aberdeen Miss	$10,000.00	$1,600.00	None given.	$1,320.00	Coal	$2.75	$750.00	$127.75	$100.00	$50.00	$3,947.75
Aurora, Ill	18,831.56	3,013.05	$500.00	2,689.74	Soft coal	1.80	2,382.50	(*)	523.24	47.93	9,156.46
Bangor, Me	34,141.01	5,462.56	None.	3,680.03	Water power.			502.90	(†)	1,228.60	10,874.19
Bay City, Mich	30,000.00	4,800.00	None.	4,220.00	Shavings	----------	1,429.79	518.34	321.72	363.05	11,652.90
Bloomington, Ill	75,000.00	12,000.00	420.75	6,112.32	Coal	1.75	2,615.00	1,080.00	(†)	4,733.68	26,961.75
Danvers, Mass	15,579.09	2,492.65	112.50	1,540.00	Coal	----------	557.09	258.40	(†)	362.80	5,323.44
Dunkirk, N. Y	13,338.71	2,134.19	None given.	660.00	Coal	----------	1,190.07	333.00	160.35	443.96	4,921.57
Fairfield, Iowa	5,000.00	800.00	None.	240.00	Coal	23.75	263.38	20.00	93.89	86.86	1,504.13
Goshen, Ind	9,000.00	1,440.00	None.	960.00	Oil	----------	804.00	120.00	100.00	(‡)	3,424.00
Lyons, Iowa	17,350.00	2,776.00	None.	1,855.81	Pine stripe	0.90	900.00	243.71	440.63	230.07	6,196.22
Meadville, Pa	20,000.00	3,200.00	56.00	2,280.00	Gas	----------	400.00	396.00	(†)	1,000.00	7,332.00
Ottawa, Ill	16,000.00	2,560.00	25.00	2,200.00	Included in preceding.			700.00	400.00	(‡)	5,905.00
Paris, Ill	10,500.00	1,680.00	None.	120.00	Coal	1.75	720.00	175.00	100.00	100.00	2,895.00
St. Joseph, Mo	62,000.00	9,920.00	150.00	6,960.00	Coal	1.65	3,697.25	1,067.86	291.61	1,170.00	23,106.72
Sharpsburg, Pa	5,725.76	916.12	None.	720.00	Gas	----------	480.00	153.00	120.00	(§)	2,389.12
Sherman, Tex	10,000.00	1,600.00	None.	1,800.00	Coal	4.00	750.00	120.00	25.00	25.00	4,320.00
Topeka, Kans	52,000.00	8,320.00	300.00	5,360.00	Coal	2.05	3,660.00	750.00	1,200.00	225.00	19,325.00
Xenia, Ohio	18,500.00	2,960.00	20.00	1,800.00	Coal	2.20	1,525.00	350.00	250.00	350.00	7,755.00

*Included in fuel. †Included in sundries. ‡Included elsewhere. §Included in repairs.

ARC AND INCANDESCENT.

Allegheny, Pa	$175,000.00	$28,000.00	$500.00	$25,000.00	Coal	$1.05	$8,000.00	$4,250.00	$3,500.00	$2,250.00	$71,500.00
Brainerd, Minn	40,000.00	6,400.00	40.00	2,500.00	Water power.			150.00	200.00	50.00	9,340.00
Galion, Ohio	26,901.35	4,304.22	None.	1,641.50	Coal and oil	----------	2,180.86	250.00	50.00	1,190.00	9,616.58
Galveston, Tex	39,990.00	6,398.40	None.	7,171.67	Slack coal / Coal	3.50 / 5.19	7,615.56	1,800.00	1,200.00	241.15	24,426.80
Herington, Kans	30,000.00	4,800.00	None	1,980.00	Coal	2.43	2,400.00	300.00	275.00	100.00	9,855.00
Statesville, N. C	8,500.00	1,360.00	82.00	1,200.00	Wood	3.60	750.00	145.00	75.00	50.00	3,662.00
Vancouver, Wash	17,000.00	2,720.00	None given.	3,612.00	Wood	----------	600.00	390.00	150.00	350.00	7,822.00

INCANDESCENT.

Charlton, Iowa	$94,600.00	$3,926.00	$50.00	$2,080.00	Slack coal	$0.50	$1,500.00	(†)	$125.00	(†)	$7,691.00
Falls City, Nebr	9,000.00	1,440.00	None.	2,050.00	Coal	2.65	(*)	(*)	(*)	(*)	3,490.00
Tecumseh, Nebr	7,000.00	1,120.00	30.00	1,000.00	Coal	2.25	300.00	80.00	40.00	10.00	2,560.00

*Included in superintendence. †Included elsewhere.

ARC LAMPS.

City.	Number of lights.	Hours of lighting. Per day	Per year	Cost per lamp. Per year.	Per hour	Remarks.
Aberdeen, Miss	35	8	2,920	$112.79	$0.0386	$720 received from rented lamps.
Aurora, Ill	83	7h 10m	2,622	110.32	.0421	
Bangor, Me	146	(*)	3,600	74.48	.0207	Number hours per year assumed. Run in conection with water works.
Bay City, Mich	141		2,221	82.64	.0372	
Bloomington, Ill	220		2,247	122.55	.0545	
Danvers, Mass	75	4 11/12	1,769	70.98	.0401	
Dunkirk, N. Y	60	10h 51m	4,000	82.03	.0205	
Fairfield, Iowa	10	3 1/2	1,278	150.41	.1177	Run in connection with water works.
Goshen, Ind	31	9.75	3,559	110.45	.0310	
Lyons, Iowa	59	7	2,555	110.11	.0431	
Meadville, Pa	70	8	2,920	104.74	.0393	
Ottawa, Ill	100		3,600	39.05	.0167	Power furnished by contract.
Paris, Ill	60	(†)	3,000	48.25	.0161	Number hours per year assumed. Run in connection with water works.
St. Joseph, Mo	253	8	2,920	91.33	.0313	
Sharpsburg, Pa	35	8	2,920	68.26	.0234	Run in connection with water works.
Sherman, Tex	43	7	2,555	100.47	.0393	Cost of buildings not given, not included in plant.
Topeka, Kans	184	(‡)	3,600	107.74	.0299	Number hours per year assumed.
Xenia, Ohio	80	(†)	3,000	97.74	.0326	Do.

*Dark to daylight. †Moon schedule. ‡All dark hours.

Cost of electric lighting under municipal ownership—Continued.

ARC AND INCANDESCENT.

City.	Number of lights.	Hours of lighting.		Gross cost per lamp (arc).		Receipts (from rented lamps).	Net cost per lamp (arc).		Remarks.
		Per day.	Per year.	Per year.	Per hour.		Per year.	Per hour.	
Allegheny, Pa.	Arc 422 Incandescent 2,500	11 24		$106.40		None.			In these cities the expenses of the arc and incandescent lights have not been kept separate. As a rough approximation, 10 incandescent lights are assumed equal in cost to 1 arc.
Brainerd, Minn	Arc 30 Incandescent 1,000	4.75		71.85		None given.			
Galion, Ohio	Arc 71 Incandescent 600	10		73.41		$2,250.00	$56.22		
Galveston, Tex	Arc 175 Incandescent 300	9		114.28		None.			Run in connection with water works.
Herington, Kans	Arc 20 Incandescent 500	5		140.79		4,200.00	80.80		
Statesville, N. C	Arc 30 Incandescent 220	Dark, 6		70.42		None given.			
Vancouver, Wash	Arc 35 Incandescent 540	12		87.89		None given.			

INCANDESCENT.

City.	Number of lights.	Hours of lighting.		Gross cost per lamp.		Receipts (from rented lamps).	Net cost per lamp.		Remarks.
		Per day.	Per year.	Per year.	Per hour.		Per year.	Per hour.	
Chariton, Iowa	1,200	12	4,380	$5.92	$0.00135	Not given.			City is said to clear $1,500 per annum.
Falls City, Nebr	400	4	1,460	8.73	.00599	$2,085.00	$3.51	$0.00240	203 lamps since added and rented.
Tecumseh, Nebr	500	5	1,825	5.12	.00281	1,680.00	1.76	.00096	

THE BUDA-PESTH CITY ELECTRIC RAILWAY.

[T. Graham Gribble in Electrical Engineer]

The most recent development of the conduit system for electric railways is that of Buda-Pesth, the capital of Hungary, situated on the river Danube. Messrs. Siemens & Halske are the inventors and constructors, and it would appear from the rapid strides which the railway company is making through the city that both the promoters and public are well satisfied with the results.

The high authority on railways, Mr. Hugo Koestler, has lately given it his advocacy in a paper read before the Austro-Hungarian Society of Building and Railroad Engineers. He is chief engineer of the Austrian state railways, and, taking as his topic the importance of electric railways as means of communication in large cities, reviewed at length the progress of the electric railway on the various systems, but gave special prominence to that of Buda-Pesth. It is from his address and the illustrated circular of the Siemens-Halske Company that the following description is prepared. There are at the present time 5.65 miles of line, mostly double track, or an aggregate length of 9.65 miles of single track. Most of this system has been in operation for a year, and the extentions which are already in course of construction are also indicated upon the plan (Fig. 1). When these are finished there will be a complete belt line around the city, and together with the cross lines will form an efficient system for meeting all the requirements of internal transit in the city. The lines now in operation are:

(1) The Station street line, opened July 30, 1889.
(2) The Podmaniczky street line, opened September 10, 1889.
(3) The Grosse Ring-strasse line, opened March 6, 1890.

There are, moreover, in costruction—

(4) The Cemetery line, for which overhead wires are proposed;
(5) The Quay line; and
(6) The King street line.

(1) The length of the Station street line is 1¼ miles and includes a double-track turnout near the power station at one of its termini, forming a connection with the Cemetery line. The usual distance of the center of the track from the nearest curb is 10 feet 6 inches. The limiting width between curbs for a single-track road was 24 feet, and for a double track 39 feet. The steepest gradient was 15 per cent and the sharpest curve 164 feet radius.

(2) The Podmaniczky street line runs from the Academy to the City Wood and is 2.17 miles long. The limiting width for construction is 28 feet in Szechenyi street, and only a single track was built. The steepest gradient is 16 per cent and is combined with a curve of 147 feet radius. The line terminates at the car and repair shops.

(3) The Grosse Ring-strasse line is double track, 2 miles long, and connects with the former two lines by curves, and also crosses several horse-car lines.

As to the roads under construction:

(4) The Cemetery line will be mainly double track and will connect with the freight depot of the Austro-Hungarian State Railway and with the Station street line. The traffic on a proposed extension of this line will be handled by steam dummies.

(5) The Quay line will run along the water front and form an inner zone with the front Ring-strasse line, and an outer zone with the Podmaniczky street and King street lines. It passes from the Academy at Suspension Bridge Place, along Franz Josef Quay, past the custom-house to join the King strasse line. For the length from Suspension Bridge Place the road is an open viaduct, the columns of which are on the lower Quay street.

(6) The King street line hill parallel Andrassy street, the finest street of the city, and will connect with the Podmaniczky.

The general structural features of the railway are not novel to this country, but the fact—if it be a fact—of the attainment by a German company of a practical and successful conduit system, adapted to general development, has attracted some attention, and awaits the confirmation of longer trial before it can be analyzed and its merits fully established.

The track and roadbed in the Siemens-Halske system consist of a conduit formed of concrete, having iron yokes spaced about 4 feet apart and similar to cable roads. (Fig. 2). The conduit is immediately under one of the running rails, and the feed and return current pass through a pair of conductors attached to either side of the iron yokes. The rails do not serve as conductors, as in the electric railway of Lichterfelde, near Berlin; neither is there a third rail for the return current,

as has been attempted on some roads in this country. Each rail is a twin rail, resembling in the main a pair of slot rails, and the wheels are double-treaded, having a central flange, which travels in the opening as in the Deacon removable rail in Liverpool, England. The twin rail, which is over the conduit, is provided with broad base flanges, and double-bolted down to the upper flange of the yoke. An analogous system, invented by Mr. Stephen D. Field, of this country, was lately illustrated in the Street Railway Journal. The yokes are 11 inches wide inside, and 16 inches deep. The total depth from pavement to foundation is 27.5 inches. The slot is 1.3 inches wide, and is prevented from closing by wrought iron knees, which fasten the rail to the yoke. The rail is named the Haarman rail, and its dimensions are calculated from its moment of resistance under the heaviest load which could possibly come upon it when acting as a girder between two supporting yokes. The rail covering the conduit weighs 94.6 pounds per yard, and the other rail 37.8 pounds per yard. The conductors are light angle irons attached to cup-shaped insulators, and are placed about two-thirds of the depth of the conduit from the bottom, in order to keep them from moisture, and the conduit is furnished with catchpits to carry off the drainage. The conductors are also entirely protected undr the running rails, so that they can not catch rain or dirt, and may not be seen or touched from the slot.

There is somewhat scanty information to be had of the details of the motor construction, either verbally or in illustration. The general arrangement appears not to differ from that of electric cars in this country. The connection and disconnection of the resistance coils is effected by rheostats at either end of the platform and underneath it. They are actuated by switch levers, and the car is completely under control. The rates of speed were established by municipal enactment, after considerable experiments on the brake power had been made, which proved conclusively that a fully-loaded car, having a weight of its own of 4.43 tons, could be brought to a standstill in a length of 26 feet when moving at a speed of 13½ miles per hour.

The maximum speed permissible on any portion of the line is 11 miles per hour, but on crossings or on narrow streets it is reduced to 6.2 miles per hour, and in the more crowded thoroughfares to 3.85 miles per hour.

The entire power is at present obtained from one station situated in Gardner street. The machinery consists of four tubular boilers of 940 square feet of heating surface, three compound condensing engines of 100 horse power each, and three rope-driven dynamos (Fig. 3).

The current is first carried to the bus bar of a switch-board, and from that distributed, through iron-bound main conductors of patent metal imbedded in the earth, to the various lines of road. These conductors lead, one to the crossing of Podmaniczky street with Ring-strasse, and two to the crossing of Station street by Ring-strasse and the third to the Ring-strasse corner of Dohány street. At these three points distributing boxes are placed, from which the working conductors are supplied through the different lines. The current is supplied at a constant potential of 300 volts.

The car shops are located at the terminals of the two radial lines, one in Arena street near the end of Podmaniczky, and the other in Steinbruck street at the end of Station street where that is connected with the cemetery line. In the Arena street shops the cars for the Podmaniczky street line are repaired and partly repaired, and partly those of the Ring-strasse.

There is also a series of car pits of a total capacity of thirty cars. The car pits are served by two traversing tables which again connect by tracks with the independent end of the Podmaniczky street line. The car pit is also connected by a traversing table with a repairing shop for four cars in which the most necessary tools and machines are furnished for performing small repairs. These machines are operated by a motor which receives current from the working conductor of the line. The repairs of the armatures and field magnets are facilitated by devices for easily handling them and removing them from underneath the car.

The operating station at Steinbruck street is also a depot for storing the rolling stock of the Station street and Cemetery street lines, together with a portion of the cars from the Ring-strasse line.

The equipment, as yet, consists of fifty motor cars and eight tow cars. The motor car weighs 4.43 tons. It is seated for eighteen persons and will carry a total, standing and sitting, of thirty-eight. The cars are run in the most crowded thoroughfares on a two-minute headway. Last summer the traffic assumed such dimensions that the company have made arrangements for the construction of larger cars. The cars perform a regular mileage of from 75 to 80 per day of sixteen hours, but are frequently worked up to 93 miles.

The interest in the conduit system is on the increase in this country. The overhead wire which has been the pioneer and stepping-stone of electrical railway construction, will soon have had its day. Already the public verdict is frequently in favor of the survival of the jogtrot horse car rather than the introduction of dangerous and unsightly overhead construction. The storage battery labors under inherent difficulties of construction and operation. Hitherto the conduit has not been a success in America, and is scarcely out of its tentative stages elsewhere, but its difficulties are not of the same nature as those of the storage battery. They are primarily mechanical and secondarily electrical, whereas those of the storage battery are primarily electrical and secondarily mechanical.

The radical difficulties with the conduit are occasioned by a confined and inaccessible conduit. The motor is practically the same. In the Siemens-Halske system reliance is placed on the careful protection of the conductor and insulators. The conductors do not receive the weight of the trolley as in some systems, and this is a very decided advantage, because when the vertical pressure of the trolley rests upon glass conductors the varying deflection of the car springs and inequalities of the track produce shocks which always break the insulators and disorganize the operation.

It does not appear from the published description what method is proposed for performing repairs upon conductors and insulators in the Siemens-Halske system. Several devices have been introduced in this country for obtaining access to one side of the conduit, such as by a removable checker plate carried continuously along the street surface, or else by handholes opposite every insulator with checker-plate covers, but there is no indication of any similar provision to this in Buda-Pesth.

The Haarman twin rail is simply a pair of T-rails with small bottom flanges connected by distance pieces, and is an old device. The sections used at Buda-Pesth appear light for heavy traffic, and if Dr. Koestler's statement regarding their strength is to be taken to mean that they were designed merely as girders, they will not be likely to prove adequate. They contrast strongly with the most recent practice in this country, which is solid and massive beyond what any engineer would have dreamed of a few years ago. The aperture between them of 1.3 inches is much more than would be tolerated in this land of narrow-tired buggies, and it is difficult to see how with a double-treaded wheel it could be made much less without involving either excessive flange-friction or a weak flange.

The double-tread wheel is not essential to this form of conduit, and forming as it does four points of support to the wheel-axle instead of two, produces a more unequal and alternating resistance to the traction when the wheels are worn.

As stated at the commencement, the test of time is necessary for the proof of this system, but the reputation of the firm of Siemens-Halske is sufficient guaranty that whatever be its merits it will not be for want of good workmanship if the Buda-Pesth electric conduit is not all that its promoters have anticipated.

Description of Conduits.

AMERICAN CONDUITS

The various American conduits now in use are, with few exceptions, fully described under the head of New York, Chicago, and Philadelphia subways. There are countless other devices developed almost daily, but want of sufficient trial does not warrant more than a mere mention of some of them.

THE LYNCH LAKE SYSTEM.

In Baltimore, Washington, and recently in Chicago and other cities, rectangular glazed terra-cotta conduits, under the Lynch-Lake patents, have been extensively introduced with strong indications of success in every respect. The illustrations of their detail construction accompanying this report are sufficiently clear to require but little explanation. The clay ducts are made with two, four, and six chambers, more usually, two and four, owing to their convenience in handling. The sections are 3 feet long with partitions slightly leveled at their outer edges. The joints are effected by the use of a sleeve set in cement mortar.

The best practice, in our opinion, though most costly, is in laying of these conduits upon a substantial bed (usually 6 inches thick) of concrete and surrounding each separate horizontal series of ducts with a 3-inch layer of mortar or gravel concrete, thus insuring not only a compact rigid mass but also protection against mechanical injury, external moisture, and entry of gas. With careful and substantial construction of the manholes and the inclosure of manhole masonry with an inch layer of cement, mortar or concrete and a reasonable provision for ventilation, the occasional explosions in conduits which have been experienced in American cities will be obviated.

CREOSOTED WOOD.

The creosoted wooden duct conduit, under what is known as the McDonald patent, has been adopted and exclusively used by the Philadelphia authorities. It consists of machine-bored creosoted planks 16 feet in length, arranged and put together in connection with manholes, as illustrated in plates 9 to 14. It is an excellent system, and has now withstood the test of five years with very few accidents or necessary repairs. The wood is all treated with the dead oil of coal tar, and is said to show no signs of deterioration thus far.

The Brooklyn creosoted wooden duct system varies only in detail of construction from the Philadelphia plans, and is not patented. In other respects it is substantially the same and is favorably reported upon.

INDURATED FIBER.

A conduit which it is understood has already been laid in several cities to a considerable extent is the patent hard fiber (indurated fiber) pipe, made of compressed wood pulp chemically treated, manufactured exclusively at Mechanicsville, N. Y., under the Medbery patents. Its inside diameter usually ranges from 1 to 4 inches. Reports concerning the quantity of this pipe laid and contracted for in Buffalo, N. Y., show 500,000 feet for the feeder wires of the electric system of the Buffalo Street Railway Company, constructed by the Field Engineering Company, who are said to recommend this pipe highly. The reported quantity laid in Detroit, Mich., for electric-light wires is 200,000 feet, with over 50,000 feet in Philadelphia for telephone cables. The pipe is also re-

ported in use for electric-light wires in New York City, Augusta, Ga., Fort Wayne, Ind., Chicago, and Milwaukee; for signal wires along the lines of the New York Central and Hudson River Railroad Company, the Pennsylvania Railroad, and the Delaware and Hudson Canal Company.

INTERIOR CONDUIT SYSTEM.

The interior conduit system is an adaptation of plans of interior house work to an outer conduit system. It has been applied in several American cities for conducting high-potential currents upon bare wires placed within the tubing of this system. Its advocates claim economy in the saving of lead casing and insulating material of conductors. The space required for each duct, and the fact that only one wire can be placed in each duct, confines its use to large single wires traversing long distances for power and lighting purposes.

THE BROOKS OIL INSULATION SYSTEM.

This system, the invention of Mr. Davis Brooks, of Philadelphia, embodies the use of heavy mineral oil, one of the best insulators, as the dielectric for high-tension underground mains. The system has recently been brought prominently to the front in this country by Messrs. Johnson & Phillips, the representative of Mr. Brooks in this matter on our side of the Atlantic. The system has, however, been well known for many years, and has received much favorable commendation in this country from no less an authority than Mr. Preece, and in America numerous experts have testified to its efficiency, and dating back as far as 1877, in which year Mr. Brooks laid some experimental wires in Philadelphia.

In 1887 a line of 1½ miles was laid by Mr. Brooks on the Pennsylvania Railroad. In this cable there were eighteen splices and fifty-three conductors, and a very high insulation value was obtained, and an important feature in reference to telegraph and telephonic circuits was practically demonstrated, viz, its low inductive capacity, which in this case gave a mean value of about 0.212 microfarads per mile.

The experience of America of over ten years, though almost exclusively telegraphic, amply demonstrated the permanence and efficiency of the system. Mr. Brooks claims in reference to these circuits that while other multiple cables have frequently broken down and developed faults due possibly to lighting and other causes, his circuits have never given way and continue to this day to give values as high as when the lines were first put down.

In the earlier experiments Mr. Brooks employed ordinary fluid mineral oil as insulating medium. This, however, was found to have a very high penetrating power, and continual care was needed to keep the oil confined. The oil now adopted, produced from the waste products of resin oil, is a thick, sticky mass, less liquid than treacle, and has the advantage of being extremely cheap.

Practical details have now been carefully worked out, and it may be confidently stated that the Brooks system, well carried out, has the best claims of permanency and efficiency of any underground high-tension system, and that it will probably contrast favorably as to cost with any other system of anything like similar insulation and permanency.

The dielectric is a pure homogeneous thick fluid of extremely high insulation value. It does not oxidize when exposed to the air, and when occupying the whole of the space in an iron pipe beyond that occupied by the conductors and their fibrous covering possesses all the elements of permanency—in fact theoretically, the system seems to exclude all the ordinary factors of decay, and the permanence of the system seems only limited by the life of the containing pipes, which in ordinary cases we believe have been known to last over twenty years when used for gas or water, where it must be remembered both the inside as well as the outside of the pipe is exposed to influences tending to cause decay; whereas in the Brooks system it is evident that no decay of the pipes could go on from the inside, and any deterioration that took place would be limited to the oxidizing and perishing process from the outside only. Hence it is urged with much show of reason that the Brooks system must rank well not on the score of insulation alone but on that of permanency.

The mechanical details of the Brooks system are seen in the accompanying plates.

The iron pipes are used in the usual lengths, made and kept in stock, and have their ends carefully bell-mouthed and connected together with T sockets, as shown in the small cut, Fig. 1; and at suitable distances draw-in boxes, Fig. 2,

are provided, which may or may not have glands for the cables to pass through, according to circumstances. Branch circuits are taken off by means of junction boxes fitted at points determined upon. The junction boxes are in all cases provided with glands for the cables to pass through, so that the fluid dielectric may be removed from the junction box for the purpose of making a branch connection, or for testing purposes, the glands then preventing the dielectric from flowing into the box from the pipes containing the mains.

The branch connections thereto are preferably lead-covered cables of the ordinary type, which also pass through glands. The junction boxes may also contain fuses between the branch circuits and the mains. The terminals are formed of cast iron of special form, provided with glands with suitable vulcanite sleeves, through which the ends of the cables are brought, Fig. 3. At the highest point at the line a tank or cast-iron box with removable lid is provided, which is occasionally examined and kept charged with the fluid dielectric, so as to insure the whole system being fully charged. A small trench being dug and a section of the line having been prepared and all joints in the pipes carefully made, the cables, which consist of ordinary stranded copper conductors, covered to a suitable thickness with raw jute or hemp strand, preferably by braiding, and again wound over all with a sewing of braiding, are coiled on drums and placed in a tank of the fluid dielectric and carefully heated up to about 300° F., and maintained at this temperature sufficiently long to drive off all moisture. The cable may be of suitable size and composed of varying number of strands. That shown in section, Fig. 4, consists of four cables of 19.13, with four pilot wires of No. 12 gauge. The end or ends are attached to a hauling-in strand of wire or rope previously passed into the pipes, and the cable is drawn in direct from the hot dielectric, Figs. 5 and 6, by means of a winch.

Messrs. Johnson and Phillips have made several very severe tests of the system at their works, and continue to have the strongest convictions that it is a reliable and efficient one. A line of 700 feet in length was laid down at Charlton, under the supervision of Mr. David Brooks, who visited this country in order to convey to Messrs. Johnson and Phillips his past experience in the carrying out of his method. The cable consisted of seven No. 18 wires, each wire double, cotton-covered, and braided with cotton twisted into a cable and braided over all. This length of cable was drawn into a 1-inch iron pipe, and the whole system filled with hot fluid dielectric. The line has now been down for about two years, and it is to-day as perfect as when first completed. During the interval many searching tests of the line have been made, and on many occasions six of the wires have been grouped into two circuits of three wires each, and a Kapp alternator giving 2,000 volts has been connected to one end of the line, and a group of incandescent lamps lighted at the other end for several hours continuously. Measurements made before and after the run showed no fall in the insulation, and it must be remembered that in this case a pressure of 2,000 volts was exerted between wires whose covering of cotton did not exceed one-sixteenth of an inch intimately twisted together.

Another line was afterwards put down at Charlton, one-tenth of a mile in length, containing two cables, each of 7-14 wires, braided with a fiber to a diameter of about five-eighths of an inch. These were drawn into the pipe in two lengths, and the whole system filled with dielectric. This line has frequently had, under the direction of Mr. Kapp, a pressure of 14,000 volts for five hours at a time upon it. The test was made by transforming up from a 2,000-volt Kapp alternator to 14,000 volts, and at the other end transforming down again to 2,000 volts, and then lighting twenty 100-volt incandescent lamps in series to full brightness. This potential gave a sparking distance between points thirteen-sixteenths of an inch at the dynamo end of the line, and at the far end of somewhat greater distance. The line tested immediately before and after the run showed no change in the insulation value.

A recent communication from America dealing with this system gives particulars of underground mains with liquid insulation laid for the Heisler Electric Company, which gives entire satisfaction, having been in constant use for nearly a year in circuits using very high E. M. F., varying from 2,400 up to 4,000 volts, and the remarkable feature is the fact that the insulation resistance is higher to-day than when first installed. Repeated efforts have been made to break down the insulation by subjecting it to various and unusual strains, such as suddenly breaking the circuit when the dynamo was running at its greatest speed, and also subjecting lengths of the line to a static charge equal to 140,000 volts. They stood perfectly, though this test is sufficient to break through every other kind of insulation, however perfect it may appear by galvanometrical tests.

In England the Brooks system has been used for a short length in the Keswick central station system. Two single No. 14 copper wires, twice braided with jute and inclosed in an iron pipe with liquid, are used for connecting the church with the overhead high-tension wires. The Brooks main goes under the graveyard to obviate the use of overhead mains. The wires have carried the full pressure of 2,000 volts for a period of over fourteen months.

They have also been used on low-tension work in a large private installation for Lord Windsor, where 500 yards of four strands of 37-13, are worked two each in parallel as main conductors under the grounds from the dynamo room to the house, to entirely do away with the necessity of overhead wires. Various other private installations have adopted the system. Besides this the system has been for many years in use on certain railways in England for telegraph wires with very marked success.

Abroad Messrs. Johnson and Phillips have just furnished the Hongkong Electric Light Company with 2,000 feet of the Brooks main for high-tension work in connection with the arc lights for public lighting. These mains are to go under the streets to work with a pressure of 2,000 volts. The plant is now in process of erection.

Our illustrations give the details at quarter full size of the junction box and terminal box shown in prospective last week. The cuts are reproduced from the working drawings and practically explain themselves. Fig. 7 shows details of the junction box which is laid under the street level. The exits or glands for the cable are arranged so that they can be packed and can also be plugged inside to prevent oil escaping if the box is required to be left at any part of the progress of the work. In laying, the cables are drawn through from point to point at these boxes, into which the liquid insulation is afterwards poured and the lid securely fastened down.

Fig. 8 shows the terminal box, which stands directly under the switchboard at the generating or at the receiving end of the lines. Glands are provided when required in the case shown for two cables and pilot wires.

In this system it is seen that there is no space left for the accumulation of explosive gasses, or gasses injurious to the dielectric, as might be the case where a solid dielectric is used in conduits or iron pipes; and Messrs. Johnson and Phillips themselves believe that the only other system that could compare on the score of efficiency and permanency with the Brooks mains, is that in which the cables highly insulated with India rubber or gutta-percha are drawn into iron pipes kept full of water.

Experience in America for a period of at least ten years has already demonstated that, in the Brooks telegraphic and telephonic mains, the cost per wire in a cable of many conductors is less than the cost per wire insulated with gutta-percha or India rubber, even including the additional charge of conduit pipe and boxes, or other device.

It has also been abundantly proved at Charlton that mains for the distribution of electric light and power will stand the severest tests that are ever likely to be required with even far higher voltages than at present are anywhere employed.

Probably one of the largest fields of usefulness for the Brooks mains will be in connection with the high-pressure three-wire alternate current distribution for lighting, and for alternate current motors, of which the installation to transmit several hundred horse power a distance of 12½ miles at 25,000 volts, now being erected at the Oerlikon Works, Zurich, is the first and most noteworthy example. Examples of the use of underdround transmission in towns where overhead wires can not be employed will probably not be long in being seen in practice. The details of the Brooks mains for this system have already been carefully worked out.

The general scheme of the use of the Brooks system for public lighting at Hongkong is shown in Fig. 9, where the overhead lines are seen coming to tall posts bearing insulators with an arc lamp above the wires. In the crowded streets, where overhead wires would not be advisable, the high-pressure wires for the arc lamps in series, carrying 2,000 volts, are taken down and under the streets in iron pipes filled with the Brooks liquid insulation, are then run along the streets and up a series of lamp-posts—one of which is shown in the illustration—and then up vertical pipes again to the overhead wires.

The details of the junction box and insulator for the top of the posts, where the overhead and underground wires are connected, have been carefully worked out by Messrs. Johnson and Phillips, and are shown in Fig. 10. The wires are pulled through the box, and the ends soldered together and insulated, and a

screw cap fixed over them. The overhead line passes to an insulator specially adapted for oil insulation. The underground mains descend on ordinary pipe, and the whole is filled up with oil insulation.

We now pass to another and important application of the Brooks system.

The prominence that is being given to high-pressure three-phase alternate-current transmission in Germany and Switzerland will make doubly interesting the details of the Brooks mains which have been worked out by Messrs. Johnson and Phillips, in conjunction with Mr. Gilbert Kapp, for the underground transmission of these currents, to be used, it is expected, at an average of some 20,000 volts.

The drawings are almost self-explanatory. The junction box, shown in Figs. 11 and 12, is for the distribution in a number of directions of the three-phase current. Each pipe contains a three-strand cable, the strands of which on entering the junction box are separated and led through glands to separate terminals, or omnibus bars, to which the other distributing cables can be connected. Provision is made for fuses, if desired, between the mains and branches within the junction box. Now that the enormous pressures, at one time considered beyond control, are being handled without much greater trouble, save for insulation, than the currents of ordinary voltage, a system such as this of Mr. David Brooks* should become more and more valuable to electrical engineers. More extensive applications for it for transmission of power, or for distribution of light, will doubtless be recorded in the near future.

THE EDISON SYSTEM.

The general features of the Edison system have been too widely published to need further description at our hands. As now developed, what is known as the "three-wire system" is mainly used by the Edison companies. In this system three insulated copper rods are placed in an iron pipe, from which they are insulated. The system is a sectional one, and each tube is as complete when it leaves the factory as a rail from a rolling mill. Like a rail, it needs only to be joined to other similar units to become a part of a continuous line.

In the three-wire system of distribution, the conductors, whether overhead or underground, are divided into two classes, viz: feeders which run from the dynamos to center of distribution, and mains which radiate from center of distribution and loop the ends of the feeders together, constituting the second class. All taps to supply customers with electric current are taken from the mains. Electric tubes are accordingly divided into feeders and mains. A main electric tube, or, more briefly, a main, has three insulated copper conductors of equal size. A feeder electric tube, or feeder, has two principal conductors and one smaller conductor to serve as a neutral wire. A feeder also has three insulated cables of seven No. 19 B. W. G. wires each. These small cables form independent circuits from the station to the point of distribution, and enable one to read in the station the electrical pressure at the outside end of the feeder. Hence these lines are called pressure wires.

The system of numbering electric tubes is based on the Edison wire gauge. The size of any tube is the number of thousand circular mils in its positive or negative conductor. Thus a rod one-half inch diameter has 250,000 circular mils area, and a tube having three such rods would be a No. 250 main.

Four sizes of pipe are used in the standard Edison tubes, and the range of sizes is given below. All pipe diameters are nominal inside diameters:

80,000 circular mils to 120,000 circular mils in 1¼-inch pipe.
150,000 circular mils to 300,000 circular mils in 2-inch pipe.
350,000 circular mils to 600,000 circular mils in 2½-inch pipe.
700,000 circular mils to 1,000,000 circular mils in 3-inch pipe.

The copper rods are all 20 feet 4 inches long, and project from each end of the pipe. All 1¼ and 2 inch pipes are cut 20 feet long, allowing 2 inches projection of copper; 2½-inch pipes are cut 19 feet 10 inches long, giving 3-inch projection; 3-inch pipes are cut 19 feet 9 inches long, giving 3½-inch projection of rod. The rods are drawn to exact gauge of the finest and purest lake copper, and have a conductivity in excess of 98 per cent. The pipes are the best grade of lap-welded steam pipe, free from imperfections and of full weight.

Fig. 1 shows sections of standard sizes of mains and feeders. Two additional small mains, No. 67 and No. 41, are made in 1¼-inch pipe for service work only.

*Mr. Brooks died at Philadelphia, June, 1891.

aking up a tube the ends of the copper rods are first chamfered and tinned
he pipe thoroughly cleaned on the inside. Each rod is wound separately
prepared rope, and the three rods so wound are made into a triangular
and wound with a fourth rope. This bundle of rods bound with rope is
to the pipe, which is afterward filled with insulating compound. A special
insures an entire absence of air bubbles and the ends of the pipe are closed
ubber plugs. The tube is now tested by means of a delicate Thomson re-
g galvanometer. The tube after testing is painted to preserve the iron
ust, and is ready for shipment.

rder to complete the system there is required a means of joining the ends
conductors in consecutive tubes, and of protecting and insulating such a
when made.

. 2 shows a joint between two main tubes partially completed. The side on
utral joint is in position ready to solder. The top coupling joint is being
to place, while the bottom coppers are untouched.

Fig. 3 is shown a feeder joint partially completed. In feeder tube joints,
the copper rods forming the main conductors are joined, the pressure wires
ed to in the definition of a feeder are connected by soldering a wrapped
, and then taping over the splice with insulating tape. The coupling
which connects the rods is made of pieces of flexible cable with sockets cast
h end. These sockets are drilled to fit easily over the rods which the joint
onnect.

. 4 shows a number of sizes of coupling joints in different views. Shorter
nger joints are made for use in turning corners, and are called elbow joints.
us combinations of elbow joints for different angles are given below. A
h or service joint is for use where a tap is taken from a main line to supply
omer. They differ from other joints in having a socket on one end only,
round pin-like projection or teat on the other end of the piece of cable.
eat fits into the holes noticed in the sides of the sockets of coupling joints,
l.

. 5 shows the branch joints and link used on all service connections up to
ncluding 120,000 circular miles area.

ring described the joints for straight lines, bends, and branches, we come
o their protection and insulation. For protecting straight work, an iron
nade in two halves and called a coupling box, is used.

Fig. 6 is shown a ball clamp, which is bolted around the tube, as in Figs. 2
. These clamps are split collars, and grip the tube firmly. The sockets at
nd of the coupling box form with the ball of the clamp a ball-and-socket joint.
clamps are made in three styles for use with 3, 2½, and 2 inch coupling boxes.
2½-inch style is made in three sizes for use with 2½, 2, or 1½-inch pipe.
-inch style is made in two sizes for 2 and for 1½-inch pipe. A clamp for use
ipe whose inside diameter is less than that of the largest tube used in the
ing box is called a reducing clamp. Thus a 1½ inch pipe, when used with a
h coupling box, takes a 2½ by 1½-inch reducing ball clamp.

½-inch coupling box is shown in Fig. 2. The 3 and 2 inch coupling boxes do
iffer, except as to size. The two halves of the box are bolted together by
through the flange. In the top half is a round hole closed by a cast-iron
Through this hole the box is filled with hot insulating compound, which
unds and insulates the copper rods, the joints, and the tube ends. This
ound does not grow brittle on cooling or with age, but remains plastic even
mperature below the freezing point. An elbow box 2½ inches, 90°, is shown
ally inclosing an elbow joint between two main tubes in Fig. 8. The 55° and
bow boxes are similar in general design. All elbow boxes allow a range
on either side of their mean position. Thus any angle between 37° and 73°
be made with a 55° elbow box. The 3-inch elbows differ from the 2½-inch
in being larger. All elbow boxes take special clamps called cup clamps.
clamps have spherical surfaces like ball clamps, but are designed to give a
er range of movement to the ball-and-socket joint formed with the elbow
The clamps for the 3-inch elbow boxes are similar to the 2½-inch cup clamp
s in Fig. 8. All boxes, whether coupling or elbow, have a round hole in the
alf through which they are filled with compound. This hole is closed by a
l iron cap, which is locked securely in position by turning it through one-
er of a revolution. This cap, shown in Fig. 9, makes a dirt-tight but not
ght joint, and is called a ventilator top.

ving disposed of the main line we come to the branches leading to the cus-
r's premises, or, as they are commonly called, the services. These are short
hs of tube which tap the main line by means of a three-way box called a

tee box (see Figs. 10 and 11). These boxes are made in two styles, 2-inch tee and 2½-inch tee, which differ from the 2-inch coupling and the 2½-inch coupling only in having three nozzles instead of two. Owing to the main portion of a tee being the duplicate of a coupling of the same size, any 2-inch coupling or 2½-inch coupling may be replaced by a 2 or 2½ inch tee without disturbing the main line. A modified form of tee called a Y-box is used where the service makes an angle of 45° with the main line. A four-way or cross box, really a double tee, admits of two services being taken from one joint.

Mains are so placed in the ground that the positive and negative conductors are on one side of a vertical plane through the center line of the tube, while the neutral or balancing wire is on the other, as shown in Fig. 12. The side of the tube which the neutral is on is called the inside, because the main tube is so placed that the neutral copper is nearest to the curb line. The feeders are laid symmetrically, with the right hand copper as the positive conductor as the tube leaves the station. Services are never taken from feeder lines. A service to the side of the main line marked inside, and called an inside service, is shown in Fig. 10, while Fig. 11 shows a service to the opposite side, called an outside service. On this basis all services are classed as either outside or inside. The same distinction is made with regard to bends in a main tube, all bends in which the neutral joint is shortened, or before on the inside of the curve, are inside elbows, while those in which the neutral joint is the longest of the three joints, are called outside elbows.

In referring to what constituted a feeder line it was stated that it was a line from the source of current to some center of distribution from which mains radiated. This requires that the feeder should be split up or branch out, or, what is the same thing, that it should be connected to two or more mains. The safety catch box is designed to accomplish this object. Inside of a safety catch box all wires of like polarity are connected together, thus allowing the current coming in on one or more lines to split up and supply the remaining lines from which customers obtain their current for light or power. The safety catch box serves, then, first, as a center of distribution; second, as a center of equalization of electrical pressure between the different parts of the system.

It also affords a ready means of inspecting and testing any line, or of disconnecting a line from the system when work is to be done on it, such as the connection of services, etc. It may be noted here that men thoroughly familiar with the work do not find it necessary to interrupt the current while making service connections.

In Fig. 13 is shown a perspective view of a ten-tube safety catch box, *i. e.*, one intended for connection to ten or any less number of lines of tubes. The safety catch boxes are built in three sizes for use with four, six, and ten lines respectively. A four-tube box has four stubs, short lengths of pipe, for connection to as many lines of main tubes. A six-tube box has four stubs for connection to mains and two larger stubs for connection to either feeders or mains. A ten-tube safety catch box has eight stubs for connection to mains and two connections to either feeders or mains. The top of the box is closed by two covers, the lower of which is bolted down upon a rubber gasket, making a water-tight joint. The upper or top cover, shown in position in Fig. 13, is heavily ribbed and takes the jar and pound of traffic. The engraving, Fig. 14, gives an idea of the general arrangement. The lower half of the jacket has nozzles cast on it into which the short pieces of pipe forming the stubs are screwed. The pipe used for stubs to which the mains are to be connected is 2½ inches inside diameter, and all the regular 2½-inch fittings can be used with it. The feeder stubs are of 3½-inch pipe, and take a special clamp which fits the elbow, and is screwed and not clamped onto the stub. The cables in the stubs run to terminals, which are connected by safety fuses to copperings having terminals opposite to all cable terminals of like polarity. The positive and negative cables in the feeder stubs are of double the size of the neutral cable, because the neutral wire is always smaller than the positive or negative copper, usually only one-third the size of the positive or negative conductor.

Fig. 15 illustrates the convenience of splitting the neutral conductor in main stubs. The left-hand figure shows a main with the neutral on the left hand facing the safety-catch box, while the other sketch shows a right-handed neutral connected to a similar main stub. The top cable in a main stub is always connected to the positive pole of the feeder through the terminals inside the box. Fig. 16 shows a feeder jointed to a feeder stub of a safety-catch box. The sockets by which a cable in a stub is connected to a rod in a tube, as shown in Figs. 15 and 16, are called cable sockets. A hard rubber board, secured on top of the rings

and shown in Fig. 14, carries the terminals needed for the small cables running in the feeders and called pressure wires. In this way the electrical pressure at the box can be transmitted through these small cables to the station, and there measured by a suitable voltmeter, enabling the attendant to maintain the right pressure under varying loads.

The system may seem burdened with details, but when the consideration comes in that the system takes the current from the dynamos and delivers it to the customer, that a tube is equivalent to 3 ducts in a conduit and 3 insulated cables, and that the system has a flexibility far ahead of any underground method of either gas or water distribution, we see that it is, when compared to its work, exceedingly simple.

EUROPEAN UNDERGROUND ELECTRIC CIRCUITS.

GENERAL REMARKS.

The following descriptions of electric conduits, with appended illustrations, are taken from a series of publications in the electrical journals. They represent the best English practice at this date, and are in use not only in London but to quite an extent in Berlin and Paris. In the main, as will be noted, they are of the solid conduit type which, once constructed, are inaccessible without cutting up the streets. Obviously the reason for this practice is the same as leads to the same practice in the Edison system, and which, at a greater expense, is provided for in the Johnston system, viz, adaption to house-to-house distribution in electric-lighting systems.

THE CROMPTON SYSTEM.

The system of underground mains used by Messrs. Crompton & Co., Limited, is that of bare strips of solid copper stretched upon glass insulators in an underground culvert, and strained in air from point to point by means of specially constructed apparatus. The Crompton system is in use for the low-pressure distribution of electricity for direct currents, with or without the use of accumulators, and is principally used upon the three-wire system of mains, though it is also applicable where desired for ordinary parallel distribution. The system has been in successful operation for about four years, and besides the original central station at Kensington and Knightsbridge, where it was first developed, and where over 12 miles of mains are now laid, it is in use or is being laid for the Notting Hill Light Company, the Westminster Electric Company, at Northampton, at Birmingham, and also in France. Nearly 100 miles of mains in all are now in use or are being laid.

In principle the system may be considered as a return to the ordinary methods of running telegraph wires, but applied to heavy copper mains, and underground. Mains for electric light were originally heavily insulated, afterward cased in lead, then passed through protecting iron pipes, and finally run in conduits or culverts. To make these culverts such that bare conductors of sufficient thickness could be strained in air—which, after all, is the best as well as the cheapest insulator—thus doing away with costly insulation, has been the aim in the Crompton system, and, in point of fact, this system is one of the earliest attempts at a practical solution of the question of underground distribution on a large scale, and its success has given a great impetus to the planning of central distributing systems.

The development of the Crompton system of electric mains has been, roughly speaking, through the following stages: First, a solid square bar was carried upon a wheel insulator fastened sideways in a culvert, changed afterwards to an upright cup insulator having a slot in its head, carrying first a bar, then modified to a bundle of wires, and again modified to a set of strips placed sideways on their edges. The alteration of the position of the strips, placed next on the flat, brought the method to one much as now in use, its later development being mostly in the mechanical form and the practical method of placing the insulators, and in the system of straining. At first this straining was brought about by the use of a right-and-left-handed screw on the solid copper bars, which drew the lengths together; the alteration was soon made of having each length strained separately, and connected together by a by-pass of solid copper As at present

used, each length of copper strip is separately strained, and the overlapping ends are then tightly screwed together by a screw-connecting piece, the strain being taken by specially constructed straining-pieces in the manner hereafter described.

The mains on the Crompton system are made to three standard sizes. They represent (1) the usual three-wire distributing main; (2) the distributing main with one pair of feeders, and (3), the distributing main with two pair of feeders. It is seldom that other sizes than these are necessary; if such cases arise, two separate culverts would be run for the distance required.

The principle of the three-wire system of distribution is now sufficiently well known. With a total pressure of, say, 210 volts between the outside wires, the pressure between the inner and either of the outer wires is 105 volts.

The wires to the houses are connected alternately in such a manner that the number of lamps on one side balances that on the other, so that no current (or only the slight difference between the two halves) is flowing through the center wire. To keep the pressure the same over all parts of the circuit, feeder mains going to certain determined points where the demand is heaviest, are connected direct from the source of supply, and thus the potential is kept constant.

In laying out a system of mains the position of the generating station is taken as centrally as possible. The streets are laid out with mains in the simplest and most direct manner, and feeder points are then determined upon at various points upon the plan. In the streets where no feeders are required a culvert for three wires only is laid, but where one pair of feeders go alongside the mains, a culvert for five wires (the three wires and one pair of feeders) is necessary. Near the station where feeders in two directions are required, culverts for seven wires (three wires and two pairs of feeders) are laid, and so for other parts of the circuit. These three sizes are shown in the illustrations. The sizes inside are respectively 1 foot 3 inches, 1 foot 8 inches, and 2 feet wide.

The trenches for the culverts are made, wherever possible, under the pavement, and the usual type of boxes are made for this situation. Occasionally, however, it is necessary to lay the mains in the roadway for some length, or to cross the road from one side to the other, and the culverts and boxes are then made extremely strong to withstand the ordinary traffic or even the passage of a steam roller.

The size of the trench in the ordinary main on the Crompton system is 2 feet 5 inches wide, and for the largest culvert 3 feet 2 inches wide by 1 foot 9½ inches deep.

The first process, when actual laying is begun, is the digging of the trenches and the construction of the culverts. These are laid in concrete, of the required width of opening, with the walls biased outward at the base for strength; first the floor is laid in concrete, and then the walls of the culvert, which are kept up by rough boarding till firmly set.

The second part of the work is the construction of insulator boxes. At every alternate house along the road—roughly, at the distance of every 15 yards—arrangements for an insulator box are made. This box serves both for allowing inspection of the insulator and as a junction box for either of the houses. An oak bulk, 4 by 3 inches, for supporting the insulators, is embedded in the concrete, each balk having round holes drilled in its center for the after reception of the insulator. These insulator balks are marked with the letters I B on the figures.

Thick York flagstones are now placed along over the culverts, and the surface is filled in and rammed down and the pavement replaced. At the places for insulators a metal frame is bedded in the concrete. Each of these frames has a properly fitting lid or box cover, B C, and these box covers are previously filled in level with concrete, so as practically to form one continuation of the pavement itself.

At certain distances along—from 20 yards up so 100 yards if the road is straight—provision is made for straining boxes. Two balks of oak are firmly bedded in concrete, one above the other, and from the fixed parts take the strain of the copper strips. The size of the balks is 4 inches for ordinary mains, 4 by 5 inches for mains with one pair of feeders, 4 by 6 inches for mains with two pairs of feeders. These straining balks are marked S B in the illustrations. After they are laid the spaces above are covered in with vast metal boxes and covers of the same type as the others.

When the culverts are finished, the next process is the actual drawing in of the mains. These come in copper strips 1 inch wide by one-fourth of an inch thick, just as rolled from the mill. They are uncoiled and stamped out straight on the ground by the workmen's feet, and the length between the straining boxes is measured and cut off. In the first place a cord is passed through the culvert,

and usually for this an ingenious and simple method is adopted. At the Kensington station may be seen a curly haired black dog, a permanent official of the works. The dog, with a cord attached to his collar, is put into the culvert and the top is closed in. The men then go to the next box and call the dog, who creeps along, drawing the cord, and so on to the end. The cord is that attached to a chain, and the chain in its turn to the copper strip which is then drawn in by the men.

At each insulator box the glass insulators are now pressed into the holes (1¼ inch in diameter) in the timber balk. These insulutors, I, are of the form shown in the illustration, with five deep rings to give a long length of insulating surface, and thus to guard against leakage by moisture creeping. The insulation is still further increased by each insulator being previously dipped in hot copal varnish. The head of each insulator is slotted out of a width to receive the copper strip. As each strip is drawn past, a man stands at each insulator box along the route and lifts the strip into its position upon the insulator. The three or more strips are thus successively drawn in.

The copper strips having been passed into the culvert are yet lying along the bottom. They have now to be stretched sufficiently taut to be everywhere in air, except where they touch at the insulating supports. A sag of about 2½ inches in the mains is usually allowed between the insulators.

The straining pieces S each consist of a bridge or arch made of gun metal, of the shape shown in the illustrations, and carefully designed to afford the requisite stability, both for resistance to the strain of the copper mains, and for holding these latter absolutely fixed, while at the same time obtaining the highest possible insulation. The insulation is assured by the use of glass insulators with deep grooves, similar to those already mentioned, but more solid and squat to withstand the strain.

In placing them into position, a ring or pad of solid India rubber, R, is first placed against the straining balk; upon these are placed the glass insulators, I. I. and then a second pad of solid India rubber is placed over each insulator, which are thus evenly bedded and enabled to withstand the heavy end strain without the edges chipping off. The gun metal bridge straining pieces S are then placed in position, and the copper main Cu is passed through the slot in the center. It should be noticed that this slot is made with the lower side sloped, or wedged-shaped. A loose piece inside the slot screws down tightly upon the copper main, which is thus slightly bent, and becomes firmly fixed or wedged in position, so that by this simple means the more the strain on the main the tighter it is gripped. The pinching screws are made of aluminum bronze or Delta metal, or in dry situations of steel.

The straining is accomplished in various ways. The most scientific and certain is that often used, of a hydraulic jack, made to form a lever to draw the mains tight up. Placed in position at the side of the trench, bedded against the concrete edge, a few strokes of the hydraulic handle tightens up the main, and the pinching screws are then screwed tightly down upon the wedge-piece W. The straining for shorter lengths is also often done by the simple means of ropes and pulleys, or by a crowbar strained against a balk, or sometimes by a right and left handed screw. The means employed are mainly dependent upon the length of the strip, and thus upon the necessity for greater or less force.

When the copper strips are properly tightened from straining-box to straining-box the ends are overlapped and tightly connected together by a grip box or connecting-box C, which simply presses the ends of the flat strips firmly together by means of pinching screws. These grip boxes are large enough to hold four strips, but can be made to hold six strips if necessary.

The culverts, when going under roadways, have to be made of extra strength to carry the heaviest traffic without fear of the covers breaking or the side walls crushing in. Certain regulations have been issued by the London county council, and the designs of culverts and covers given are constructed fully to comply with these requirements. The trenches in these cases are about 4 feet deep. The illustrations show cross sections and longitudinal sections of a 2-foot culvert under roadway. The smaller culverts are of similar construction, the only difference being in the width. The culverts have a solid cement bottom and the walls are of 9-inch brickwork set in cement and with an inside coating of cement, to prevent any percolation of moisture. They are also sometimes constructed entirely of cement, 9 inches thick. Two methods of covering the culverts are adopted, according to judgment. They are either covered in with two thicknesses of 2½-inch York stones, or, in some cases, with cast-iron covers having ribs on the upper surface and filled in with concrete. Both these methods are shown in the illus-

trations, Fig. 7 being a longitudinal section of a culvert, half of which is covered with thick York stones and the other half, indicating the culvert, is covered with ribbed iron plates and concrete. Fig. 16 is a reproduction from a photograph of the work of trenching.

The covers to the boxes under the roadway have, of course, to be adapted to the nature of the rest of the roadway surface. Both the insulating and straining boxes are dealt with in the same way. The covers are made of a cast-iron frame, hollow on the upper side, fitting into the boxes, and easily removable for inspection. The hollows in the upper surface are filled in with concrete, cement, asphalte, or other material to match both the color and the rate of wear of the material of which the roadway itself is constructed. The joints of these covers are made water-tight, and at the same time noiseless, so as not to vibrate under the traffic, by inserting a serving of tarred rope in the framework of the box before the cover is put on. Where wood pavement is in use the cover is made with ribbed openings of the necessary size to match the rest of the pavement, and hardwood blocks are cemented, as shown in the illustration, Fig. 9. The arrangements for connecting a culvert under a roadway with that under the pavement are seen in Fig. 8.

It sometimes happens that the space under the footway is so small that culverts can not be built. In such cases heavily insulated cables, drawn into pipes, are used for the distance required, each cable having its own separate pipe. The ends of these pipes are brought into insulator or straining boxes (Fig. 17) of the same form as those used for the culverts, and the cable is screwed tightly to the copper strips in the manner shown. Similar arrangements are adopted for connecting the house mains to the three-wire mains. They are led to the nearest insulating box, and are connected respectively to the inner main and one of the outer mains. If it is ever necessary to alter the balance of the current in the two halves of the three-wire mains, it is a matter of a few minutes' work to lift the cover, unscrew one end of the house main, and screw it upon the opposite outer-main strip.

THE WESTMINSTER SYSTEM.*

The general idea of the Westminster mains (shown in Fig. 1) is that of a small underground culvert formed of concrete, in which numerous earthenware insulators are imbedded at very short intervals to carry bare copper strips. The insulators have slots to receive these copper strips, which are drawn in after construction by means of a little trolley running along inside the culvert, the copper strips simply lying upon the insulators without straining. Nothing much simpler could be devised, although the plan is evidently the final outcome of much thought and a considerable number of trials. The system is not patented, simply being what may be termed a direct and common-sense solution of the problem. A good many miles of this culvert is already laid in conjunction with the company's central stations.

The Westminster system is not unlike the Crompton conduit (which has been employed in a part of the district in which Messrs. Crompton have been contractors for main-laying), but the culvert devised by Prof. Kennedy is shallower, and the arrangements are all simplified by reason that the copper strips are not strained.

The usual size of the culvert for the three-wire system is 7½ inches deep only, by 15 inches wide. After the trench is dug the concrete is shaped by means of wood templates to the section shown, tapered slightly outwards at the bottom for strength. The culvert is made several inches wider at the top than the bottom, leaving considerable ledge on both sides of, extending the whole length of the main, as shown in the figures. This ledge serves as a kind of rail for the drawing-in trolley (see Fig. 2), which is an integral part of the Westminster system.

During the time that the concrete is still soft, hollow earthwork insulators, of the shape shown in detail in Fig. 4, are imbedded in the floor of the culvert. These insulators are molded with slots for the reception of the copper strips, and with projecting ridges to prevent the creeping in of moisture. They are placed at the distance of about 6 feet apart. This distance allows the copper strip to lie in the slots with a quite negligible bending or undulation. A spacing of 8 feet was first tried, but was found slightly too much.

In all cases possible, the copper mains are laid at the time the culvert is made and before the covers are put on, as this saves the trouble of drawing in. But only sufficient copper for the immediate needs has been so laid, the remainder

* This system is in very successful operation in London, and a similar method is employed in Berlin, Germany, and recently in Paris.

being afterwards added as the demand increases. The mains themselves are solid copper strips, 1 inch wide by one-quarter of an inch thick, 98 per cent conductivity copper. The copper comes coiled in bundles, and a special tool has been devised by Prof. Kennedy for quickly and easily straightening it, for as the strip in this system lies without straining on the insulators, it is, of course, necessary that it should be practically without bend. The tool used is shown in detail in Fig. 5. It is a lever handle moving on a bolt which can be fixed in any suitable place; near its lower end it carries two cams, with milled edges, somewhat loosely pivoted on strong pivots. In between the jaws formed by these cams the copper strip is seized, and by a motion of the lever is forcibly stretched, straightened out, and given a light permanent set.

The details of construction of the trolley used for drawing in all strips, except such as may be laid in place before the culvert is closed in, are fully seen in Figs. 6 and 7. A wrought-iron plate, suitably grooved and drilled with holes, and bent up to form a carriage, is mounted upon four hard-wood rollers, two each side. The wrought-iron carriage has (for a three-way culvert) grooves for three strips; the strips are clamped down by a cover-plate and tightly held by pointed studs. Usually only one strip is drawn in at a time. The strip to be laid is attached to the groove on the trolley corresponding to the position desired, and the rope, which has been previously passed through, is fastened to the hole in the trolley opposite the copper strip, and the whole is hauled through from the further drawing-in box, the strip simply dropping into its place as the trolley passes. The trolley has been found to act admirably.

The Westminster Company is at present supplying all its 36,000 lights on a single two-wire system, but all arrangements are being made to change over to the three-wire system during August and September. The system actually to be used is rather a double two-wire than a three-wire system, for Prof. Kennedy has so arranged that by balancing large blocks of buildings, or sides of streets, against each other, it is seldom necessary actually to lay three lines of strips side by side in one distribution culvert.

An interesting and important point is that of insulation, and in this respect, in spite of the number of the insulator contacts, exceedingly good results are found. Even when tested on very wet days, in order to get the least favorable results possible, the result of the test of the mains themselves has been, with rare exceptions, "infinity," which, in this case, means that the insulation of the section tested is over 14 megohms. The large number of insulators has in no case as yet been found to have any effect in diminishing the insulation, nor has any trace been discovered of a tendency of water to form a film on the insulators, and so cause leakage. The maximum leakage in current which can be got to earth is not generally more than will light one or sometimes two 16-candle power lamps in parallel. This, it must be remembered, is including all house leakages and defects from 16,000 or 20,000 lamps (8-candle power) in each district.

THE CALLENDER-WEBBER SYSTEM.

Two systems of underground mains for electric-light distribution are carried out by Callender's Bitumen Telegraph and Waterproof Company, Limited, of Leadenhall street, London. These two systems are known respectively as the Callendar-Webber system and the Callender solid system. In both of these, highly insulated copper cables are used, laid underground in trenches and protected by bitumen. The method of using the bitumen constitutes the difference between the systems.

In the Callender-Webber system the bitumen is molded into solid casings having holes throughout the length, and through these the insulated cables are drawn in. This gives facilities for the removal of cables and the substitution, if necessary, of others, and for the provision of spare space to be occupied by other cables as the demand increases, without the necessity for again digging up the streets.

In the Callender solid system the insulated cables are laid in an iron trough and the whole filled in solid with metal bitumen, the cables being held practically immovable when once laid.

The decision as to which of these two systems is the most suitable depends largely upon conditions of cost and of locality. The solid system will in most cases be the cheaper, if the cable is for a certain stipulated transmission of current which will never be exceeded, or if the demand for current is known or can be estimated closely, so that necessity for alteration or addition is not likely to occur.

The general arrangement is well shown in the descriptive section and plan,

Figs. 1 and 2, of the roadway, showing six feeding mains, laid under the among a bewildering array (not at all uncommon in towns) of gas and wate and main sewers; with a distributing main on the three-wire system laid the footpath, feeder boxes and service boxes being constructed flush wi pavement.

The appearance of the bitumen casing is clearly indicated in Fig. 3. It i in 6-foot lengths of blocks of bitumen concrete, pierced in the manufacture b rying number of holes or ways. The standard sizes of these cable cases are in Fig. 4, and are for two, three, four, or six ways, of either 1½, 1¾, or 3 diameter.

The bitumen concrete is composed of natural bitumen (one of the most d materials known) mixed with sand and wood fiber, specially treated. T sulting material is tough and strong with great power of resistance to cru breaking, and tensile strains. It is impervious to water, is not affected or acids found in the ground, and is a nonconductor of electricity. It do expand or contract, and is capable of withstanding, when imbedded in the g the weights of heavy traffic. It can be made to any shape, and the cases bent up or down or to curve to the right or left on the job in the work of l and the process of laying is comparatively simple. When laid, each wa closed passage, completely separated from all the other ways and from ea an insulating wall of bitumen, and the cables are therefore subject to nc vorable conditions from contact with each other or from deleterious or cond substances.

When constructing the conduit it is easy to lay the casing with a large ber of holes than is necessary for present requirements, the additional being easily drawn in as the demand on the network increases without o the roadways or disturbing the traffic.

The following table gives the stock sizes, with the size of cable taken:

Sizes of Callender-Webber casings.

Size.	1½-inch ways, taking up to ⅛ cable.	1¾-inch ways, taking up to ⅛ or ⅞.	2⅜-inch ways, taking up to ⅞ cable.	3-inch ways, takes over ½ inch section area, insulated.
Way.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
2	4¼ by 2¾	3¼ by 6	4 by 6¾	5 by 6
3	6¾ by 8¼	3¾ by 8¼	4 by 9¼	5 by 13
4	4¼ by 4¼	6 by 6	6¾ by 6¾	9 by 9
6	4¾ by 6¾	6 by 9	7 by 9½	9 by 13

In laying mains underground, whatever the system, it is advisable to them as near to the houses as the cellars will admit, and as far as possit trenches are made under the footpath. When the pavement is of a costly and the roadway is of macadam, it is better to run the trenches along the but usually the pathway, if not already occupied by telegraph mains or cellars, is best and cheapest.

Under paved footpaths the depths at which the mains are run need o sufficient to be just below the higher gas and water service pipes, the co foundations of asphalt, or the flagstones of the pavement. In practice, the t of the trench is usually 12 to 18 inches below the pavement level, but in where space is limited the casings can be run with perfect safety in 3 or 4 of depth. This adaptability of the system for limited space, combined w high mechanical and electrical protection and its power of curving up, or or to one side, make it extremely convenient in many places where mor systems would be inapplicable.

In the roadway is it customary to have the trench 3 feet deep? Under a nary macadamized road this depth will be quite safe for all ordinary traf for temperate climates. If the roadway is concreted as for wood or aspha ing, it is sufficient to have the mains laid immediately below the level of t crete. The actual process of laying the Callender-Webber mains is as fo

The course of the main is first laid out, and the trench dug to the re depth. The trench is made in as straight a line as possible, and is son carefully leveled, a good foundation being secured by ramming down t Occasionally rough concrete is employed in the trench to bed the condu

this is necessary only in exceptional circumstances. As long lengths as are permitted by the authorities are opened at a time, arrangements being made to avoid interference to the traffic by bridging the trench where necessary. At crossings, however, the work is done in short sections to avoid blocking the traffic. The surplus earth is everywhere carted away regularly.

The bitumen casing is next laid upon the bottom of the trench and jointed together. This jointing is carried out length by length to form one solid and continuous casing. Each fresh 6-foot length is placed on the ground, with 2 to 3 inches interval between it and the one already laid. In the mean time some bitumen concrete is being heated in the large iron caldrons. Mandrels are pushed through each of the holes in the casing, joining the two sets of holes together. Then the bitumen concrete is run in, stamped into position, and shaped into the same shape as the original casing. The joint is thus made absolutely waterproof, and the mandrels insure the holes being smooth and continuous; the result is practically one solid bitumen casing, and except for the newness of the material, a person passing along can hardly tell where the joint has been made. The mandrels are then pulled out, the earth thrown in again, rammed down, and the road repaved.

In certain circumstances where the mandrels can not be used, a different method is adopted. The ends of the casing are butted together (see Fig. 5), and saddle pieces of material similar to the case itself are placed at the joint, which is made tight by a little bitumen seared with a hot iron.

The next detail is the construction of the drawing-in boxes.

These are constructed in a simple manner by the building of a pit in brickwork at the places required, in the manner shown in Fig. 6. In the larger sizes these are made 3 by 3 feet and about 4 feet deep. The bottom is not concreted, but left in ordinary brickwork, so that any moisture that may get in may easily drain away. The walls of the pit are built up, and the bitumen casings are so arranged that they project about 6 inches into the pit. Above them the brickwork, overlaid and tapered up, as shown, forms a manhole in the surface of the street, having a cast-iron box and removable lid.

The cover plates are generally made 18 by 12, 20 by 15, 24 by 15, or 24 by 24 inches, according to the size of the pit. The plate on the footpath is filled in with cement to resemble the paving in which it is placed. In some cases, where access is not often required, it is often found desirable to seal in these boxes. For this purpose the boxes are cast in a special form (see Fig. 7), so that a second lid can be placed on the inner rim there seen under the pavement lid, and the box then made absolutely water-tight by sealing in the false lid with red lead or asphalt.

Three different kinds of boxes are in use:

(1) Feeder boxes, for the connecting of feeders to distributing mains.

(2) Service boxes, for the connection of mains to customers' mains at points where large supplies of current are to be taken off.

(3) Supply boxes, for the supply of householders, put in, if required, when service boxes are too far away. These latter are usually constructed of cement or brick built around the conduit after it is laid, so that the conduit is cut at the point most convienent for tapping the cables.

When the conduit is all laid and the various boxes properly built the drawing in of the cable itself follows next. In the smaller sizes of casing a cord is passed in as the conduit is laid. The mandrels are specially made with a hook at the end, to which the cord is fastened as each length of casing is laid and the mandrel withdrawn, the cord is therefore drawn through. With the larger sizes of holes such a precaution is not necessary, and when the conduit is laid a jointed rod, something like a sweep's rod, can easily be pushed through from box to box. This is attached to a cord, which in its turn is drawn through and pulls in a rope. The rope is attached to a cable, which is pulled in either by a number of men hauling or by the aid of a winch. The ways are quite smooth inside, and 500 or 600 yards (one-third of a mile) in one length of cable can be drawn in without any great difficulty. Lengths such as these would only be used for feeders or for supply mains in the country, and for town supply the lengths would be of from 50 to 100 yards, or often less where the demand was heavy and the service boxes numerous.

The cables that are used are Callender cables of high insulation, with dielectric of vulcanized bitumen, and are made as follows: The conductor is of stranded copper cable of not less than 98 per cent conductivity. This is first covered by a solid sheet of bitite (bitumen vulcanized under the Callendar process) put on under heavy pressure at one operation. This core is then served with tape and

insulating compound, and again served with either jute yarn or additional tapes finally braided with hemp yarn and passed through a bath of asphalt compound The cables are thus made extremely durable, resisting perfectly themselves al action of moisture or coal and sewer gas. When laid in this solid casing of bitu men therefore they are practically indestructible. The bitumen is also, it ap pears, a thorough protection against rats, for although these mains have been laid now for several years the rats have never been found to bite either the cables or the casings, although it is known they have made in some cases the spare holes in the casing their mode of travel.

In connecting the mains to branch or service supply circuits the course is often adopted of building what are termed fuse-boxes, Fig. 8, in the ground, in which the junction of the service line is safeguarded by the insertion of a solid fuse. The outer pit is made of a depth to suit the position of the casing with its wires. The inner box is made water-tight, and is placed inside the pit with air space around it. The bitumen casing projects a few inches inside the inner box, to which it is carefully sealed with bitumen. The upper lid or manhole of the whole street box is set flush with the pavement, and any little moisture that might get in simply drops to the bottom of the pit and filters away.

THE CALLENDER SOLID SYSTEM.

In the Callender solid system of underground electric mains, the cables, heavily insulated, are laid in suitable troughs, generally of cast iron, placed in trenches under the street, and the whole of the vacant space in the trough round the cables is run in solid with refined bitumen. All the bitumen employed is genuine, natural Trinidad bitumen, free from any mixture of gas, tar, and pitch

The whole forms a solid and compact mass, into which neither gas nor water can possibly penetrate, and which itself forms a very high electrical insulation There are few substances more durable than this bitumen, and with cables thus embedded there is little probability of any deterioration taking place in mains when once laid, while the thorough mechanical protection which is insured reduces to a minimum the liability of injury from exterior causes.

Mains laid on this plan are permanent and form a sound engineering job. It is of course clear that such mains should only be laid when the conditions do not require that the capacity of the cables should be afterwards altered. The Callender solid system is especially suitable for connecting mains for isolated plants where the conditions are settled and well known, for heavy mains in large cities where the consumption is likely to attain its maximum at once, for heavy distributing networks, and for the heavy feeders which are run to various points on the system of three-wire distribution. It is also peculiarly suitable for arc lighting on the series system, where long lengths of single or double mains are required to be run.

The combination of vulcanized bitumen, as the insulation for the cable itself with plain bitumen run around it as a sheath in the trough, is one that insures an absolutely safe and constant insulation, on which faults are unlikely to appear Repairs, when necessary, are easily and rapidly made. Altogether it forms one of the most trustworthy and satisfactory methods of placing cables under ground and has a certainty of being more permanent and lasting than most of the other parts of an electric-lighting plant. The work of laying, once done, is thorough and complete.

The troughs for the mains are made of cast iron. For town work this is especially preferable, as it offers a permanent protection from the picks of workmen of other companies. In some cases the upper surface of the trough, having been filled nearly to the level by bitumen, is covered by a layer of cement. In others the trough is covered in with cast-iron lids. The thickness of the metal is from three-sixteenths to five-sixteenths of an inch, varying with the size of the trough and the liability of the soil to disturbance. These iron troughs are made in lengths of 6 feet, having socket pieces cast on one end, so that when fitted together the surface inside the trough is of one level. For carrying the mains round corners and for changing levels at crossings circular pieces and curved troughs are made, but considerable deviation from the straight line is possible with the ordinary type.

In country roads and in places where wood is plentiful troughs of sound timber are often substituted for those of cast iron, care being taken to select wood which will stand under ground without rotting. The planks should not be less than three-quarters of an inch, and the lid should be of 1-inch stuff. It is not advis

able to use creosoted wood, as the action of the products of coal-tar distillation are found to be injurious to nearly every form of dielectric.

Brick and cement trenches are occasionally used for special situations, but they are expensive and offer no advantages over those of cast iron.

The ordinary shapes and sizes of mains on the Callendar solid system are shown in Fig. 1, which comprises sections of four-way and six-way insulated mains laid in bitumen in iron troughs and covered over at the top with cement.

A very usual case in distributing network is where a pair of heavy feeders to a distant point are run along with the distributing mains in the same trough. This arrangement is shown in Fig. 2. In both cases the position of the cables in the trough is kept by bridges of hard bitumenized wood of the shape shown, which are first thoroughly dessicated and then saturated with bitumen. These prevent the cable from touching the bottom of the trough or of accidentally shifting their relative positions.

In Fig. 3 is shown a pair of heavy feeders, 91 strands of No. 9 wire. These are highly insulated, and each covered with outer lead casing, then laid one above the other in solid bitumen in a narrow iron trough, and covered in with cast-iron lid. The joint of the trough is shown in section below.

In actual practice the method of laying is as follows:

The trenches in the ground having been dug and leveled, the iron troughs are laid therein, and are joined together in one length with countersunk bolts and nuts, Fig. 4.

Bitumen is meanwhile being heated in the caldrons, and a little of this run along the bottom of the trough. While still molten the bitumenized wood bridges are pressed into place across the trough at intervals of 18 inches apart. When the bitumen is set, the cable, which has been brought on huge drums, is paid out into the trenches, and laid along into the spaces of the wooden bridges. The cable is then drawn taut, and melted bitumen is poured in between the cables, and between the cables and the sides of the trough.

This is done by moving the bitumen caldron on wheels along the trench, and, by means of a large ladle, pouring a little molten bitumen in at a time. When this first layer is cool, the men come back again and pour in a little more, and so on, for about six times, thus allowing the bitumen to fill up every cavity round the cables. In the case of cables above one another, the whole process is, of course, repeated along the length. The bitumen is run into within an inch of the top of the trough.

When the bitumen is quite cold a layer of Portland cement from 1 inch to 3 inches thick, according to circumstances, is put upon the top of the bitumen, and where crossing a roadway a brickwork, cast-iron, or other protection is placed over the top to guard against damage from heavy traffic.

We now come to an interesting point, the connection of feeders, mains, and service lines.

In connecting the mains together, two different methods have to be considered: (1) Those in which the joint is solid, permanent, and covered in with insulation in the same manner as the rest of the cables; and (2) those in which the connections of feeders to distributing mains and of those to house-service mains are sometimes required to be altered or disconnected, either for change of load or for testing.

We will first of all take the solid connection, premising, however, that it is now found desirable to use the second or changeable method in very many cases where the solidly insulated junction used to be employed.

In making the solid connection on the Callender system—as, for instance, where feeders are required to be permanently connected at a certain point to the distributors, or where two distributors are required to be connected in parallel to two other distributors at right angles—the method shown in detail in Fig. 5 is adopted. A double cast-iron box is prepared, cast in one piece, with an inner and an outer box, shown in plan and section, having their corresponding lids. This double box is pierced on all four sides with openings for the mains to be connected. The two larger mains are now cut to the requisite length to just pass a few inches into the inner box; and their copper ends, E E, are bared. A solid round copper socket, P, having a flat connecting piece projecting upwards, is securely sweated or soldered on each of these bared ends. The second pair of distributor cables, D D, are passed right through the junction box without cutting, and a space of some inches is bared to the copper upon each of them, these spaces being not opposite to each other, but opposite to the mains to which they are to be connected. Similar copper pieces, P P, are sweated to each of these bare places, one copper piece being fixed on the main D, on a line with the ends

of the first main E E, and the other piece being fixed on a line with the second main cable and projecting upwards to the same height as the copper pieces thereon.

All that has now to be done is to place solid lengths of copper bar, L L, across the mains, securely fastened by nuts and bolts, the positive main E E to the distributor D, passing over the other distributor without touching; and the negative to the negative distributor D, passing over the positive without touching.

The cables and the connecting pieces are then insulated by semivulcanized material, and then protected by tape; the inner box is filled in with molten fine bitumen, and the cover placed on. The outer box is then similarly filled in with bitumen, thus forming a perfect protection from moisture getting into the joints in the inner box. The last lid is placed in its place, and the whole covered up with earth and finished off level to the road with the same paving as the roadway itself.

In certain cases these four-way boxes are left without the inner space being filled in with bitumen to allow junctions of house mains to be easily made. This type of box is, however, designed to be filled in solid and permanent, and, if accessible, junction boxes are required for the junction of house-service mains or of a branch distributing main, a solid main fuse is used in a fuse box with accessible manhole. These accessible fuse boxes are applicable to either system, solid or otherwise, and therefore need not be again described.

We now pass to the system of connecting mains and feeders in an ordinary central station network. In an extensive area of supply, the mains, both of feeders and distributors, will spread over a considerable area. Two things may happen to necessitate change in the connections. In the first place, a fault may be found, in which case tests would require to be made, and a certain length of cable might be required to be cut out of circuit; and, again, the demand for current may be altered in certain districts, and the points at which the feeders should feed into the distributors may require to be changed to some other point. It will be seen from this that a ready and rapid method of disconnecting mains and of connecting up others in their place is desirable on both grounds.

A simple yet ingenious method is used in the Callender system, shown in plan and section in Fig. 6, which illustrates a single pole junction box, having the ends of a network of four subsidiary mains connected to the feeding main. The principle of the arrangement is that of having, on the ends of each main, lugs of solid copper, which can be screwed to a copper "omnibus" bar, and so arranged that each, if unscrewed, can be swung round off the bar, and thus disconnected at once, without interfering with or touching any of the others.

The way in which this is carried out is easily seen in the illustration. A double cast-iron box similar to those already described for the simple four-way junction has leading into it the ends of the main M M. To each of these is sweated or soldered copper socket pieces, P, having a broad solid lug of copper, L, which is pierced for a bolt. The broad solid omnibus bar O B is bolted closely to these lugs, having a short piece of similar thick copper, S P, through which the full connection across is made. It can easily be seen that by unscrewing this swing piece, S P, and swinging it back, the main M becomes disconnected.

In the same way the ends of the distributing mains are led into the junction box, each having its end bared and a socket piece fastened thereto. Short swing pieces, S P, are then bolted between the omnibus bar and these distributors. If occasion arises to alter the connection, or to cut off the supply from a certain district, all that is necessary to do is to unscrew one bolt and then move the swing piece round clear of the bar. The position of these pieces is arranged so that each can be swung round at its center without the necessity for touching or removing any other connection.

The accessible junction boxes are fitted with an india-rubber gasket round the joint of cover, and are screwed down with a phosphor bronze set screw.

The buried junction boxes are used under roadways and are covered with the ordinary pavement without cover plate, the paving being lifted if it becomes necessary to examine the connections, in which case the bitumen can be easily removed by the use of a heated tool.

Ordinary sizes of cables are: For feeders $\frac{6}{11}$, equaling 1 square inch sectional area; $\frac{6}{11}$, equaling six-tenths of an inch section area of copper, and both can be laid up to 250 yards length; for heavy feeders $\frac{9}{8}$, equaling $1\frac{1}{8}$ inches sectional area, laid in 150-yard lengths. The distributors are usually $\frac{6}{11}$ cable, one-quarter of an inch sectional area, or $\frac{1}{11}$, one-tenth of an inch sectional area, laid according to circumstances, up to 600 or 700 yards. The latter size is usually employed for the house-service lines.

The Callender solid system is particularly applicable to high-tension systems for arc lighting in series where the mains have to be led from lamp to lamp under the streets, and the strength of current remains constant without necessitating increase of cable section, even if the number of lamps is increased.

Sections of mains for high tension are shown in Fig. 7, where the sizes of troughs for four and for six highly insulated $\frac{7}{8}$ cables are given. The process of laying is exactly the same as that previously described, with the exception that the troughs are always covered with a cast-iron cover, or in particular places with steel covers, to afford absolute security against accidental interference by picks of other workmen.

The method of connection of the arc lamp-posts in series is seen in section and plan in Fig. 8, where a junction box at a street corner is shown. The cables are laid in the trough with sufficient spare length to go up the lamp-post without joint, a junction box being let in under the pavement and covered with a steel-plate lid. These high-tension mains can be easily laid in lengths up to one mile without joint.

The following is a fairly comprehensive list of central stations at which the Callender and Callender-Webber mains have been laid down:

Chelsea. The Chelsea Company. Draycott Place station, Clabon-Mews station, complete set of feeders and distributers.

South Kensington. The Chelsea Company. Egerton-Gardens central station, complete set of feeders and distributers.

Whitehall. Metropolitan Company. At Charing Cross.

Strand. Electricity Supply Company (late Gatti). Bull Inn-Court station, and along the Strand, Charing Cross district.

Liverpool. Liverpool Electric Company. Three stations, comprising the complete district between Lime street and the docks.

Birmingham. Birmingham Company. All the central portion of the city.

Bath. Mr. Massingham. Arcs for the town lighting. Incandescent supply for private lighting.

Brighton. Network for corporation plant.

Le Mans, France. Central station network.

St. Austell. Central station for private supply.

Victoria Station. Edison and Swan Company. Installation for the railway station.

Law Courts. Crompton. Law Courts building.

Temple. Edison-Swan Company. House lighting in the Temple.

Westminster. Westminster Company. Many miles of Callender-Webber casing laid in conjunction with Crompton mains where culverts were unsuitable.

Northampton. Crompton & Co. Several lengths of main, laid both on Callender-Webber and solid system, in conjunction with Crompton culverts.

In addition to which are a large number of mains for isolated installations, amongst which are: Buckingham Palace (Her Majesty, Queen Victoria), Hatfield House (Lord Salisbury), Normanhurst (Lord Brassey), and many others.

THE FERRANTI SYSTEM.

The following from the London Electrical Engineer, under date of July, 1890, fully describes the Ferranti system. It was at that time under process of construction. The article of Mr. Caryl D. Haskins, read last February before the National Electrical Light Association, gives further details. We are informed that, at this time, the system is completed and in full operation, with satisfactory results. The fact that the alternating system is specially applicable where the light is furnished remote from the source of power, makes it of special interest in the future electric lighting of the city of Washington.

Among electrical engineering enterprises at the period of early development of the industry in England, the large central high-tension system at Deptford will remain noticeable, not only on account of the largeness of its conception, but also on account of the remarkable difference of opinion and statements of fact which have arisen about it.

We must first of all remind our readers that the scheme at Deptford comprises two engines of 1,500 horse power and two engines of 10,000 horse power, driving Ferranti 10,000-volt alternate-current dynamos for transmission of current through mains to London, and transformation there to currents of 2,400 volts, as for some years distributed from the Grosvenor Gallery. Of these engines, one of the 1,500 horse-power engines is erected and has been running since November, last year. This is the only engine running at Deptford at present. A second

one is already erected, but is not yet used for supply, and two 10,000 horse-power dynamos are in course of construction, and parts of the immense 42-foot fly-wheels the 27-ton shaft, and the hugh cranks are being turned up in machine tools erected inside the station.

It will be remembered that the Farranti concentric mains not being ready, the company laid and ran from Deptford to Charing Cross temporary cables of special manufacture. These, however, were found to be unable to stand the high pressure of 10,000 volts, and a reduction of 2,500 was made, the inner conductors only of the two cables being used.

At this pressure current was transmitted for some time from Deptford to the Grosvenor, where it was used together with the current from the Grosvenor dynamos. The arrangement under these conditions is shown in the diagram, Fig. 1. It is hardly necessary to remark that such an arrangement reduced by half the output that could be transmitted at even the half pressure before used of 5,000 volts, and at this lower pressure the whole lighting of the present installation of 38,000 lamps could not be supplied from Deptford.

An ingenious arrangement was therefore adopted and has been running for some weeks, by which, though the pressure to earth from the cables is only 2,400 volts, yet the total pressure of the current transmitted is 5,000 volts, under which conditions the whole lighting can be, and has been, done from Deptford, the Grosvenor acting merely as reserve. This arrangement, which will doubtless greatly interest our readers, is shown in diagram in Fig. 2. The Deptford dynamo is run at 5,000 to 6,000 volts, and one pole of the dynamo is put to earth. But instead of transmitting direct to the Grosvenor, the current is put through transformers at Deptford, transformed and transmitted to London, still at 5,000 to 6,000 volts. Now, as will be seen by the diagram, though the total pressure between the mains is 5,000 volts or more, the difference of potentials between each of the cables and earth (the insulation being kept the same in both) is exactly what it was before in the case of one only, viz, 2,400 or 2,500 volts. In this manner the danger of sparking to earth is overcome, and double the energy is transmitted.

The exact arrangement of the transformers is indicated in diagram, Fig. 3. Four transformers are arranged with their low-tension coils in series in the dynamo circuit with a high-tension fuse on one pole and the other dynamo pole being put to earth. On the other side of the four transformers their poles are connected in parallel, passing through two high-tension fuses and so into the main cables to London. So that each set of four transformers transforms from 5,000 to 6,000 volts, with three fuses in circuit, and one pole on the dynamo side of the transformer being to earth. Three sets as above are arranged at Deptford, each set with its own main switch and three fuses, so arranged that one, two, or three circuits can be thrown in at will, according to requirements at London as intimated by telephone.

These diagrams are reproduced from those kindly given to us by the company's engineers.

Accurate records are kept from day to day and from hour to hour of the current and pressure registered. The amounts now registered in daily running show currents of from 30 up to 120 ampères at pressures from 5,000 up to 6,000 volts. This, it will be observed, is already nearly two-thirds the pressure of 10,000 volts ultimately intended to be run. The main laid was originally intended for this higher pressure, with a loss in transmission of 8 per cent. The current, as at present sent, is at half or two-thirds only of this, and, of course, the loss in transmission is naturally somewhat higher at the lower pressure. But it is interesting to note that, notwithstanding this extra loss at present, the actual cost of manufacture per unit delivered at London from Deptford is stated by the engineers to be considerably less than the cost of manufacture at the Grosvenor.

For the manufacture of the Ferranti concentric mains special machinery has been erected at Deptford, and is now in full working order. Some 2 miles or so of main are now being turned out every week, and on our visit we were shown the entire process from beginning to end.

The main is of section shown in Fig. 4; first, a small thick hollow tube of copper; then the main insulation; over this the outer hollow conductor of thin copper tube; then another thin coating of insulation; and, lastly, a steel outer casing for prevention of mechanical injury.

The first process is that of insulating the inner conductor. Copper tube of the required section (one-fourth of a square inch area) and size is cut off by a circular saw to a length of 20 feet. This is taken to a long trestle, and long stripes of

brown paper, 20 feet long and some 4 feet wide, are gummed at one edge to the copper tube. This is now taken to the covering machine. This insulating or covering machine has been specially designed and adopted for the manufacture of these mains, and works with great ease and simplicity. At one side another machine prepares specially coated paper. This machine is nothing more than a long hot plate, coke heated almost to the scorching point, over which long strips of brown paper, from huge rolls like that used in printing newspapers, are drawn by rollers. On the hot plate all moisture is driven out, and the strip of paper then passes down, into, and through a hot caldron of special black oil or wax, coming out soaked in this wax, and is then dried and cut off into 20-foot lengths. These lengths are carried to the insulating machine first mentioned and laid in heaps underneath a long metal table in front of this machine. The copper tube is slowly rotated, and six or seven sheets are then wound on till the inner tube is covered as thickly and tightly as possible.

The next process consists simply in slipping this 20-foot length of insulated tube into a second hollow tube of thin copper, which forms the outer conductor, and which is of corresponding total section to the smaller and thicker inner one. Then the whole is passed through a large draw plate, and the outer tube is carefully drawn down tightly over the insulation.

Next, the insulating process is repeated on the larger conductor—gummed brown paper, inserted sheets of prepared waxed paper, hot wax bath, rolling, and tapping.

Finally the first stage of the manufacture is completed by slipping on the exterior protective casing of thin steel tube. In this steel tube is a small hole drilled in the center previously and through this hole hot wax or bitumen is forced in by a force pump, driving out all air at both ends and forming a compact and solid mass.

Next comes the most important and interesting part of the manufacture of the Ferranti mains—the construction of the joints. When we remember that some 6 or 7 miles of this cable are to be laid in each main, that three mains will be laid from Deptford to London at once, and that a joint comes every 20 feet, it is evident that the joint is the point at which greatest care must be taken to have perfect insulation and perfect protection against creeping or sparking of the 10,000-volt current.

The joint is made in the following neat and simple way: First the cable, as manufactured in lengths, is taken to specially adapted turning lathes. There one end of the main is turned carefully and smoothly down in a taper of 6 inches length, from the center conducting tube backwards to the outer conducting tube, as shown in Fig. 5. This turning is carefully and accurately done to gauge and by tools set at the required angle, and is polished off to a smooth surface.

The interior of the inner copper conductor is accurately bored out and smoothed, and then a length—some 18 inches or so—of turned solid copper rod is forced into this, a tight metallic fit, as in Fig. 6. Then a sleeve of thin copper tube, slightly larger than the outer conductor, is slipped over the end of this outer conductor, left here for several inches for the purpose, and is then corrugated down upon it with three corrugations, as shown in Fig. 7. This corrugation is an essential part of the construction of the Ferranti main, and is a neat, simple, and effective method of securing both good metallic contact and strong mechanical juncture. The method of corrugating on is carried out with a smooth, polished steel wheel and grip, and it is used, as will be seen, several times in the making of the joint. This finishes one end of the length. The end is filled up with a piece of greased waste and capped with a tin cap ready for transport by railway.

The other end is treated in a corresponding way to form an exactly opposite contour, into which the end of the next length can be pushed tightly. The insulation here is turned out in a hollow-coned or taper form from the exterior inward for the length of 6 inches, as shown in Fig. 8. This turning is also carefully done with tools set at the required angle, and smoothed or polished, and the ends meant to join are tested together to see that they fit.

The main is now ready for actual jointing. In making the joint the ends are pushed together, the solid inner rod, which projects from one end of each length, going into the interior of the inner conductor of the next length. Previously to the jointing, a joint cover, composed of two pieces, Figs. 9 and 10, is slipped some distance back over the main. This joint cover comprises a sleeve or tube of waxed paper insulating material, and a length of steel tubing formed like a reducing junction, as shown in the figure. To make the joint the ends are pushed together as mentioned, and then are forced together by hydraulic pressure till tight home. The joint is now heated, and the smooth taper surfaces of the joint

stick together. After this the copper sleeve, which has now slipped forw over the joint, is corrugated down in the manner before explained upon the ot side of the main outer conductor, thus forming metallic connection with outer conductor; when this is accomplished the paper insulating sleeve, v the exterior steel protecting piece, Fig. 10, are slipped forward over the jc Hot wax or bitumen is forced in to fill up the space, and finally each end of steel-jointing piece is corrugated down upon the steel protecting tube of the n itself, so forming a compact solid joint.

Thus the joints are made. About two-thirds of a mile of this main has t laid and practically tested since April 19. Pressures of 16,000 volts to 18,500 v have been kept on this length, at intervals as the dynamo has been running, s since. Since then fresh lengths have been added from time to time, each len being tested as it was put on, with 18,500 volts. No breakdown whatever ha curred, even in testing. The actual working current has not actually been pa through at this pressure, owing to the evident difficulty of getting rid of, or sorbing, this enormous energy. But this length of main has been tested with ampères of current at a low pressure, and immediately after this test the full tes pressure of 18,000 volts was turned on with equally satisfactory results. One of the main, where it entered the Deptford works, has been twisted and bent wavelike form to show that bending can be done without damage to the ca and also to test this method of allowing for expansion without the necessity special expansion joints. We shall await with impatience the actual workin these mains in London, but it will be seen that the particulars we have been to give show great promise of a satisfactory method of dealing with the enorm tensions with which Mr. Ferranti has associated his name at the Deptford tral lighting station.

THE FERRANTI SYSTEM.

[By Caryl D. Haskins.]

I keenly appreciate the compliment which your committee has paid m naming me to appear before you to-day to read a paper.

I fully realize that much is expected of me, and I believe I even more f realize my inability to handle the subject with the completeness which I c wish.

My connection with Mr. Ferranti was not of long duration, and it is now s time since I severed my connection with him, so that my information, wh pretty complete, so far as it goes, is not as thoroughly up to date as it should

The Deptford station was far from finished when I left London, and 10,000 v generated direct from the dynamo was still a matter for surmise and conject

Under these circumstances the best thing I can do, I believe, will be to t up each feature of the system separately, and describe it to you in its various fo and applications as thoroughly as I can. Starting with this plan in view, I h arranged my paper under the following heads:

Methods of distribution, Ferranti dynamos, Ferranti transformers, fuses, and the Ferranto meter.

Starting then with Mr. Ferranti's methods of distribution, I will deal with the old and somewhat famous Grosvenor Gallery station, from which rent, at a pressure of 2,500 volts was distributed throughout the most wea portions of London's west end by means of overhead wires.

At the Grosvenor station there were two dynamos, each of 625 horse po nominal. These machines I will describe later on.

From these generators the circuit was carried to five double-pole, double-th switches, each having a break of 2 feet and breaking both sides of the lin once.

Each of these switches represented a circuit, there being five circuits in all from the Grosvenor station. It will readily be seen, therefore, that the sw board of this station, which distributed light to no less than 35,000 lamps, wa exceedingly simple affair; yet, with their five switches, any desired combina of machines and circuits could be made.

It has quite frequently been stated, I believe, that these two machines at Grosvenor were run in multiple. This is in no sense true, though, since th moval of these dynamos to Deptford station, they are to be connected in manner, I understand.

From the five main switches the current was carried through Ferranti fuses of rather peculiar construction, having a break of 2 feet. These fuses I s describe later. From the fuses the circuits were carried on ordinary wirin

an overhead distributing pole. From this center the wires branched in five directions, being carried over the house tops and not through the streets, as is our custom in America.

Stranded steel cables seven-sixteenths B. W. G. are stretched from pole to pole, and from these cables the mains are supported at frequent intervals by means of leather thongs or slings, thus saving undue chafing and straining of the conductors. This method of supporting the mains presents many marked advantages, the wear of insulation is reduced to a minimum, and the liability to a ground is very much diminished. The leather slings stand the wear and weather exceedingly well, and renewals are much less frequent than would be expected, especially if one take one's footwear as a basis for calculation.

All streets are crossed at right angles, and no difficulty is experienced with the ubiquitous telephone man.

Contrary to the custom in this country, the primary wires are generally run into the house to be lighted, where they are connected to the transformer, a Ferranti fuse being placed in the circuit.

The secondary circuits are of 50 or 100 volts pressure, as may be required, and the house wiring is quite of the usual style, having a principal secondary fuse at the transformer and a Ferranti recording meter in series with the lamps.

The Grosvenor Gallery, as a generating station, is now a thing of the past. It has been reconstructed, and is now one of the four transforming centers of the Deptford system, which draw their energy at the phenomenal pressure of 10,000 volts from the machines in the great station on the Thames.

This heavy pressure is reduced at these central points by means of large transformers, and is distributed over the London housetops at an E. M. F. of 2,500 volts in the manner I have already described, the only difference here being that these overhead mains are on a secondary instead of a primary circuit, and the house circuits become tertiary instead of secondary.

The portion of the Ferranti system of distribution which has given rise to the most interest and which has been most talked of is the present primary circuit, extending from Deptford to the four central distributing stations in London.

Many curious and wonderful letters regarding this have appeared in our journals at various times and have given rise to much confusion and many wild conjectures, whilst the real facts of the matter are, I believe, but little understood.

The shape and principle of Mr. Ferranti's concentric main is familiar to all, but a few words descriptive of it may not be out of place here.

Over a copper tube, about 1¼ inches in diameter, insulation is wound in the form of a stout manilla paper, thoroughly saturated with a special insulating compound. This insulation is wound on to a thickness of one-half inch by a machine specially designed for the purpose by Mr. Ferranti; over this insulation a second copper tube is placed, of the same sectional area as the inner one, and this is drawn down till tight.

The cable is made in lengths of 20 feet, and stands static tests of immense pressure. Special plug and expansion joints are provided for connecting the lengths, which are also thoroughly reliable.

The original intention was to lay these mains with the outer tube directly to earth throughout its entire length, thus rendering the system absolutely safe, since only one side of the circuit could be touched by the hand, and there would be no difference of potential between this and the ground.

Alternating circuits and grounded telephone lines do not agree, however, and the law demanded that the Ferranti mains be laid duly insulated from earth; this is therefore done, but one terminal of the machine is still connected to ground, and comparative safety is the result, since it will readily be seen that to short circuit through the body it would still be necessary to touch the inner tube of the conductor. This would necessitate cutting through the outer tube and insulation, which would mean a short circuit from tube to tube, through the cutting instrument, a dead short circuit on the machine, certainly, but perfectly safe for the meddler.

At the collector boxes of the machines an accident is impossible, since the collectors are inclosed within an iron box, the lid of which is magnetically locked by the exciting current, nor can the machine generate when the box is open, since the exciting circuit is not complete till the box is closed.

Unfortunately time was an object in the starting of the Deptford station, and much contract-made cable was laid. The greater part of this was the lead-covered cable so frequently mentioned. This was not of the concentric pattern, but an ordinary stranded cable. I understand that it was guaranteed to stand considerably above 10,000 volts, but after being laid it was found not to stand 10,000 at all, and to give but poor satisfaction even at 5,000.

This unfortunate trouble has given rise to much talk, and has been scarcely well understood by the general public.

Several other kinds of cable were tried, but gave equally unsatisfactory results, and all mains have doubtless by this time been replaced by the Ferranti concentric cable, which stands the pressure perfectly and gives most satisfactory results.

Of the various expedients to which Mr. Ferranti had recourse during this trouble with the cables I am not prepared to speak, first, because I am not fully informed regarding them, and, secondly, because they form no portion of the Ferranti system of distribution. They were simply makeshifts, necessitated by an unfortunate happening and by lack of time, and they have probably given rise to more discussion, both in and out of the papers, than has the system itself.

I will now pass on to a description of some typical Ferranti dynamos. First among these, a few words are due to the original form of Ferranti alternator, which, while it is no longer manufactured, still, without doubt, was a machine of marked efficiency and great originality.

The characteristics of this earliest dynamo are, I think, about as follows: The figures are not based upon my personal experience, for the machine was out of date long before my time, but upon various fragmentary notes from my pocket-book and a generous quotation from Thompson's "Dynamo-Electric Machinery."

As in the Siemens machine of similar type, the fields formed, as they do now, "two upright circular crowns of electro-magnets with opposing poles." There were sixteen magnets on each side; thirty-two in all.

The pecularity of the machine lay in the armature, which consisted of a series of zigzag loops, eight in number, wound or folded one layer upon another, and separated by alternate ribbons of strip insulation of similar width. The winding was in three multiple circuits, each strip making ten turns around the zigzag coil, thirty layers of winding in all.

Each of these three coils is connected at one end with a solid star-shaped brass boss, which, bolted together from either side through the loops of the zigzag coil, form a solid center for the disk armature, and at the same time connect directly with one of the collector rings, the three coils all again uniting in an inner star-shaped piece of brass, which in its turn communicate with the second collector.

The disk armature was 30 inches in diameter and one-half inch thick. Its extreme thinness permitted the magnet poles to be brought very close together, enough space only being allowed to insure safe clearance. The natural result of this was a very efficient field.

On these bundles of irons, at the portion wrapped with insulation, is wound the secondary, which is in its turn wrapped with insulation; on top of all this the primary is slipped in the shape of a number of coils, wound elsewhere on former blocks. These coils are slipped on, one by one, and separated from another by washers of shellacked cardboard.

The projecting irons are then turned back over the coils from each end, lapping each other, first one way, then the other, like shuffled cards, and the last two are fastened off by a simple double L or tinsman's joint. Half of each bundle is turned back in each direction, up and down, forming complete magnetic circuits in two directions.

The transformer is extremely convenient in case of repairs, when the irons are really straightened out and burnt primary coils replaced.

It seems, however, to have several marked defects, the flat side of the lamination is presented to the penetration of the lines of force, which, according to Kennedy, is incorrect construction, and the transformer is inclined for this reason both to heat rather badly, and to hum, the latter trouble being partly due doubtless to the fact that the iron can not be held so firmly in this style of converter as in the more common type, where the iron forms a solid block.

The transformer is incased within a cast-iron shell, from which it is insulated, and into which the primary and secondary terminals are fixed by means of the Ferranti sulphur insulation.

These converters are made in five sizes, 25, 50, 100, 150, and 200 lighters. The large transformers for reducing the 10,000 volts of the primary to the 2,500 volts of the street circuits are of the same construction as these I have just described, the insulation being, of course, increased to bear the enormous pressure.

This is not the original transformer used by Ferranti; that was the Gramme ring type, and rather more efficient than the present one, I believe, but scarcely practical from a mechanical standpoint.

There now remains to describe only the Ferranti meter, a most ingenious recording instrument, largely used in connection with Mr. Ferranti's London cir-

cuits. This meter consists of a coil, of a few turns, in series with the lamps, which passes around a core of soft iron, and terminates in a composition metal ring, which is split to prevent Foucault currents, and is bolted onto a soft iron base, being, however, insulated from it. Thus it will be seen that the ring, the base, and the soft core around which the coil passes (the lower portion of which is burnt or cast into the ring also), form, respectively, sides, bottom, and top of a hollow and tight trough; the iron is continued from above the coil, by means of a horseshoe-shaped laminated piece of iron which passes down outside of the coil and makes contact with the base; thus we have a magnetic pole at the top and bottom of the trough.

This trough is filled with mercury, making contact with three-fourths of the inner circumference of the ring, and the center of the base. The current entering the coil, passes around it to the ring, and from the ring through the mercury to the base, on which is the other terminal.

Under the combined influence of the magnetic field and the current passing through the mercury from center to periphery and vice versa, the quicksilver is caused to rotate.

A shaft passes from a jewel in the base, through a small hole in the iron core to a train of wheels at the top; on this shaft is an aluminum fan suspended in the bath; this is all balanced so nicely that it actually floats in mercury.

Now, since the resistance to rotation due to friction is approximately proportional to the square of the speed, and the turning moment is proportional to the square of the current, the number of revolutions performed in a given time is a measure of the current which has passed through the meter during that period.

Owing, however, to the rule of friction not following this law absolutely, and owing to the additional and irregular friction of the gear, a sensible error is introduced. This difficulty is overcome by placing a shunt coil of high resistance around the series coil, which secures an excess of electro-magnetic action, when the friction is greatest in proportion to the torque, thus assisting the low loads.

The meter is very accurate, and has a quite wide range, 1 to 50 ampères being the capacity of the 100-volt instruments; it is equally serviceable on direct or alternating circuits of any frequency.

This meter, while undoubtedly accurate, has many very apparent weak points however; the mercury volatilizes quite rapidly, especially when the instrument becomes warm; the meters must always be kept upright or their contents will spill, and they can not be carried from place to place without being emptied and refilled, which, as the quantity of quicksilver varies, is apt to introduce errors. In view of these troubles, Mr. Ferranti is now also manufacturing and using a number of meters of small capacity, similar in principle to the well-known Shallenberger instrument, which are sufficiently accurate for general use; these are manufactured under the English patents of Mr. Wright, one of Mr. Ferranti's staff.

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General plan of conduit system proposed.
Maps of Western Union Telegraph Company's lines.
Map of telephone lines.
Map of electric-light companies' lines.
Map of District wires of fire-alarm and police-signaling service.

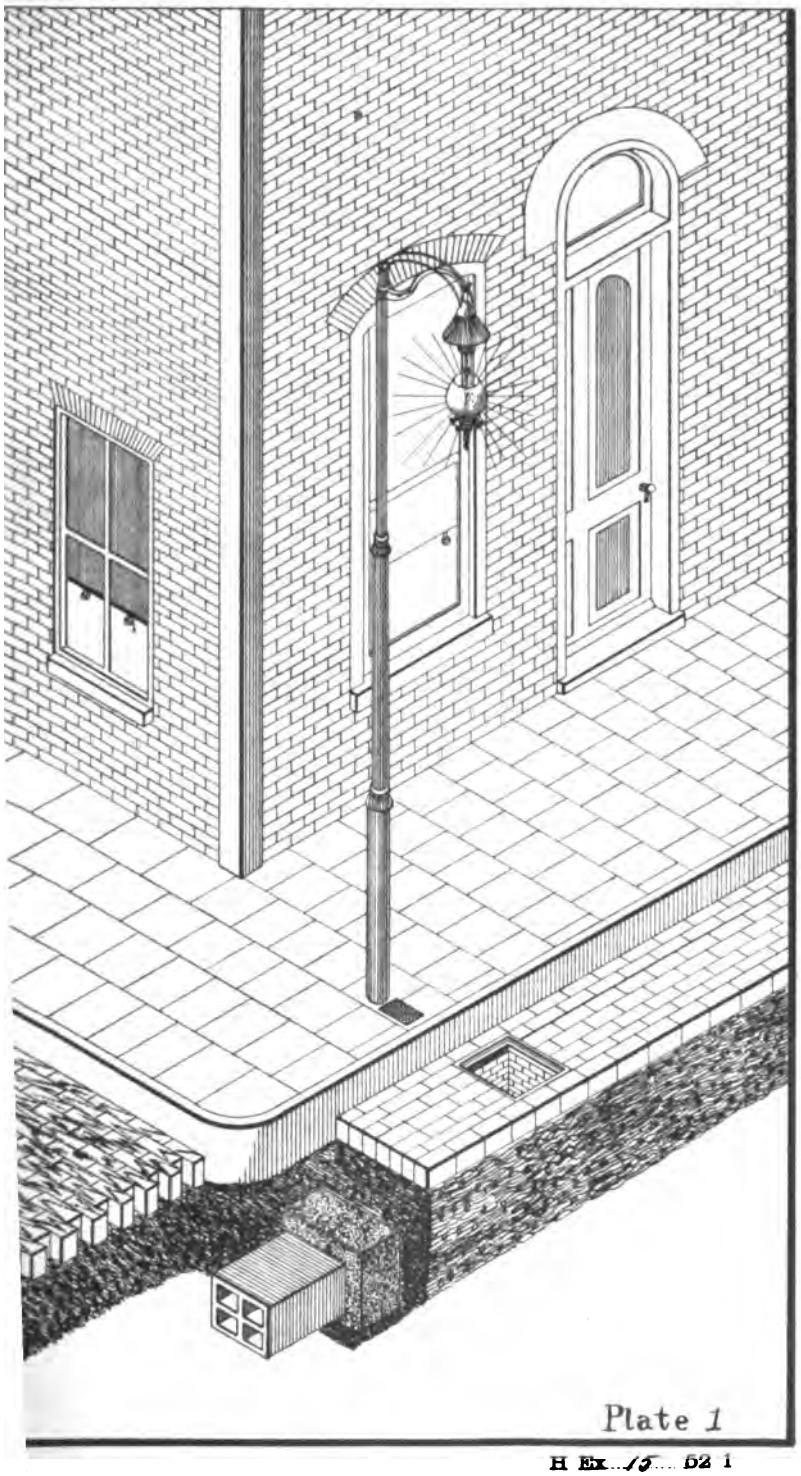

Plate 1

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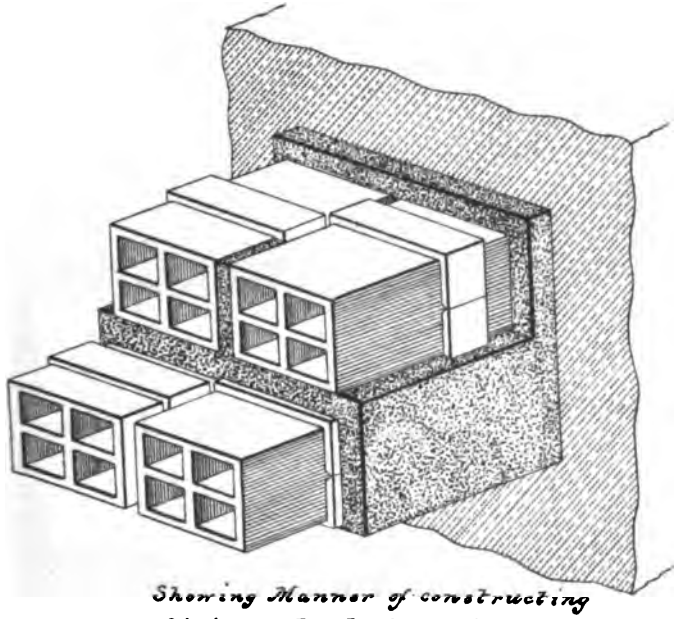
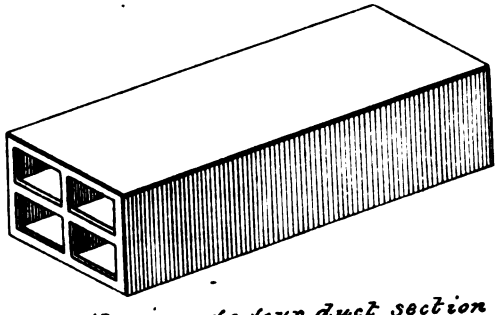
Plate 2

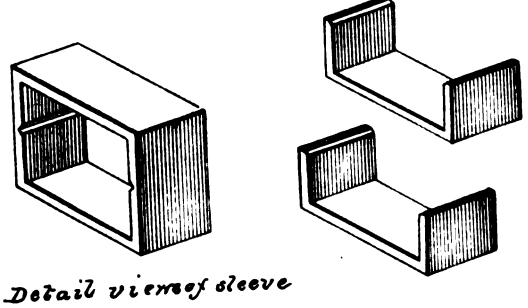
American System



Showing Manner of constructing
Sixteen Duct Conduit



Detail view of a four duct section

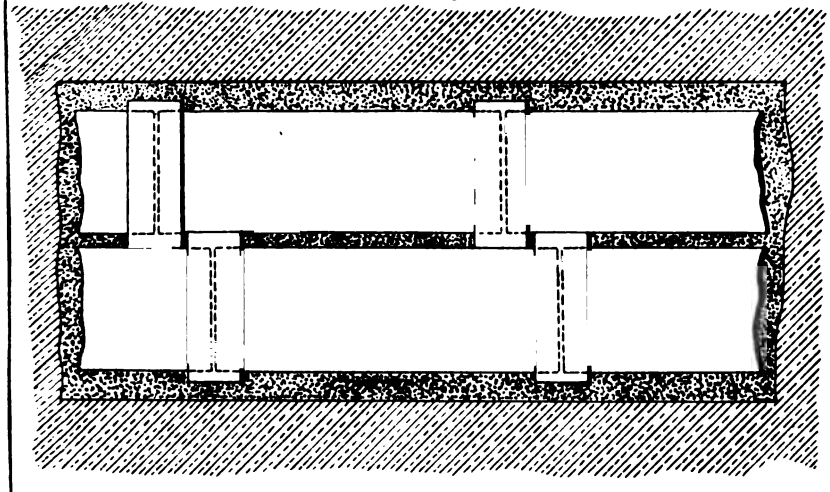


Detail views of sleeve

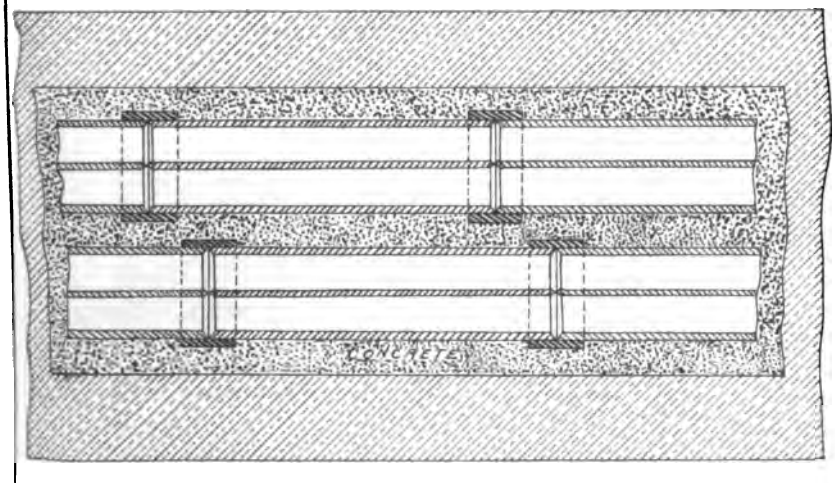
H Ex. 15 52 1

Plate 3 American System

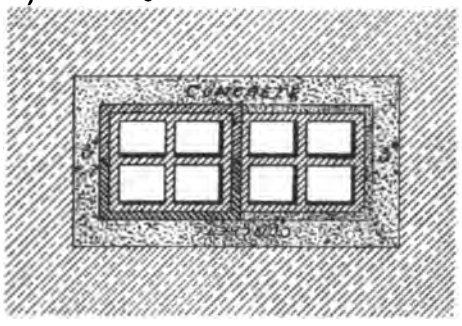
Plan of Conduit



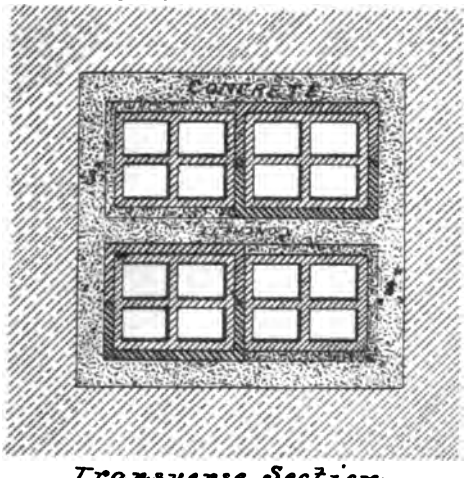
Vertical Section of conduit



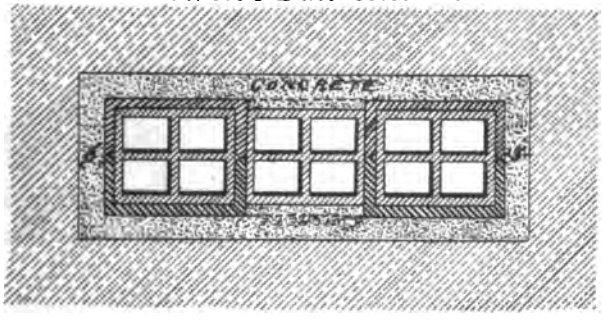
Transverse Section
of
Eight Duct Conduit

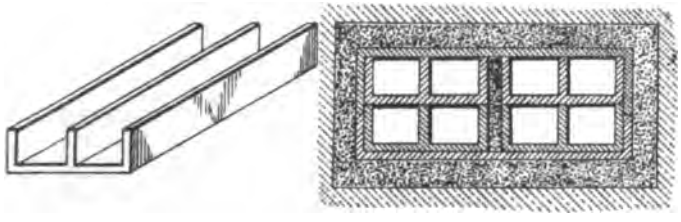


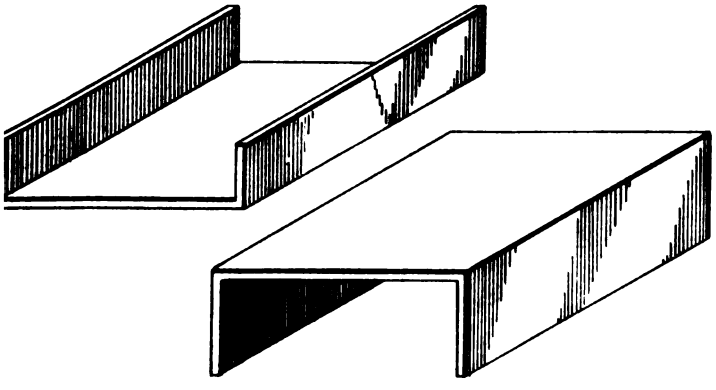
Transverse Section
of
Sixteen Duct Conduit



Transverse Section
of
Twelve Duct Conduit







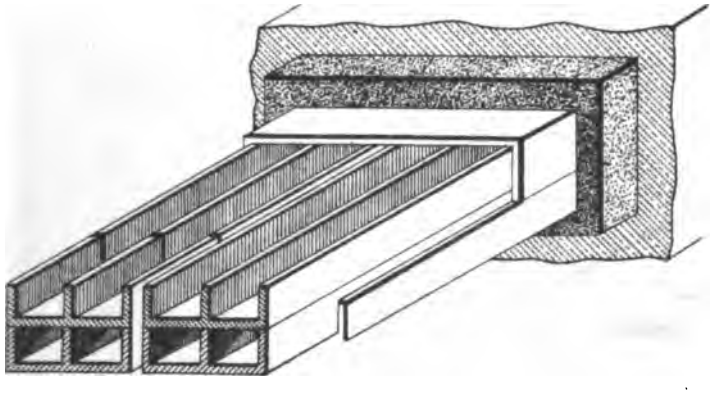


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Plate 6 American System

Fittings for House Connections

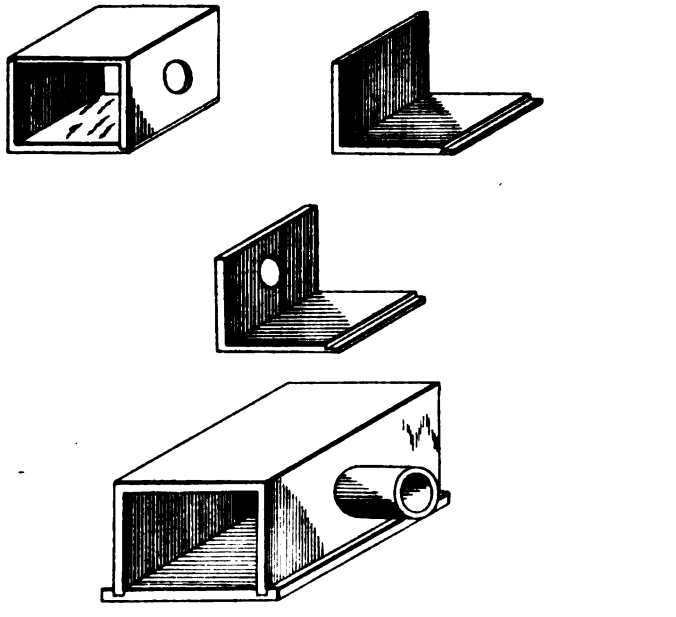

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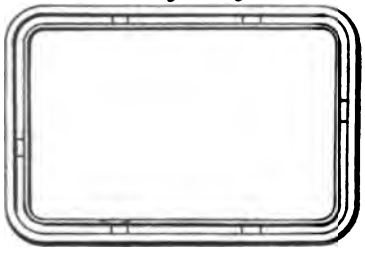
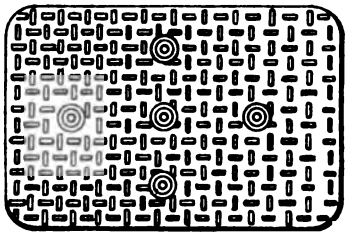
Plate 7 American System

MAN AND HAND HOLE CASTINGS

Plan of Ring

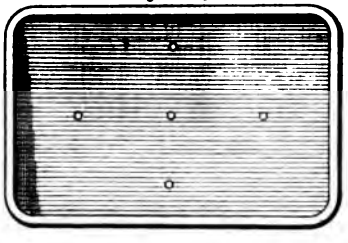


Plan of cover

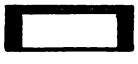


Plan of cover

Inverted Plan of cover



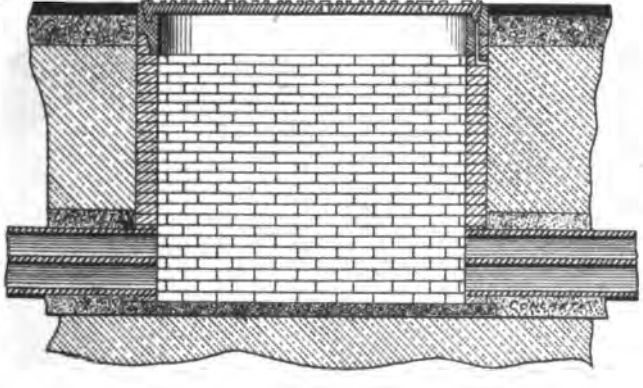
Vertical Section of Ring and Cover



Plan of Ring

Vertical section of man-hole, Ring, and Cover.

Roadway Level



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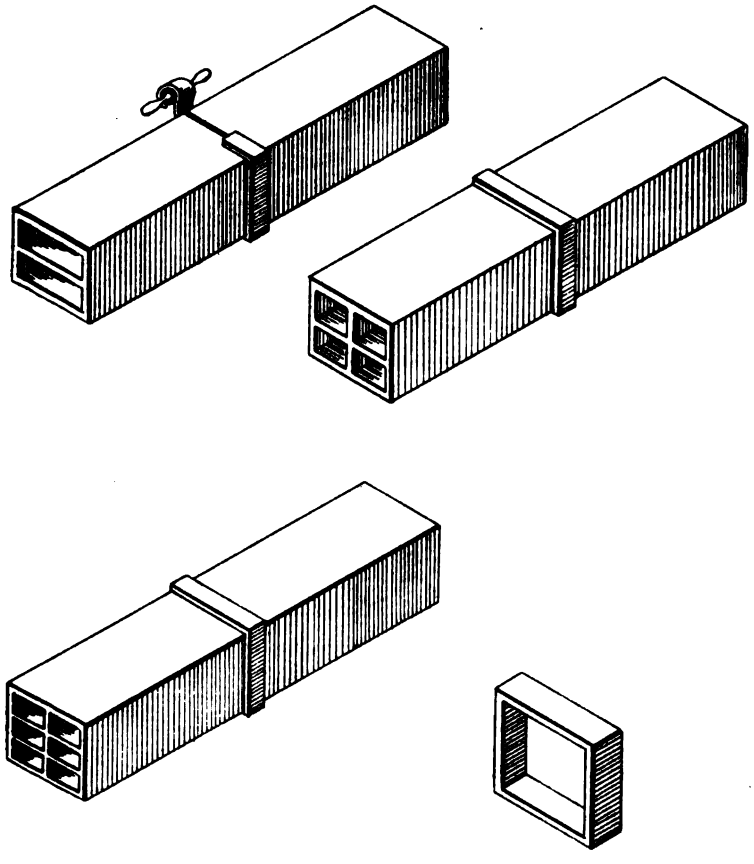


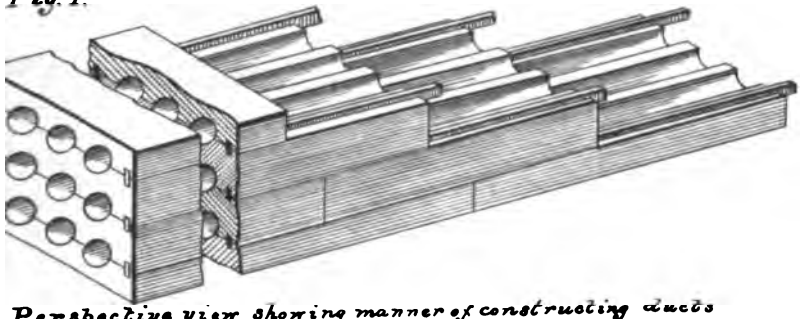
H Ex. 15 62 1

American System

CREOSOTED WOODEN CONDUIT
AS
CONSTRUCTED IN PHILADELPHIA

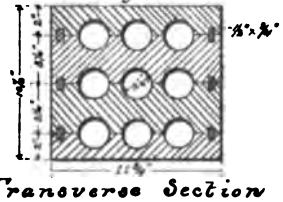
McDONALD PATENT

Fig. 1.



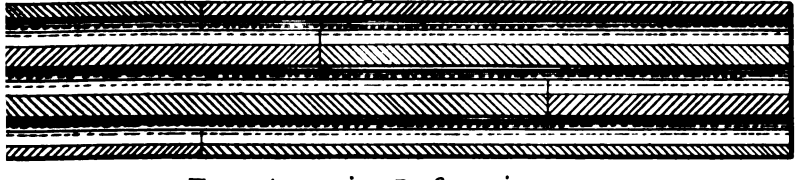
Perspective view showing manner of constructing ducts and breaking joints

Fig. 2.



Transverse Section

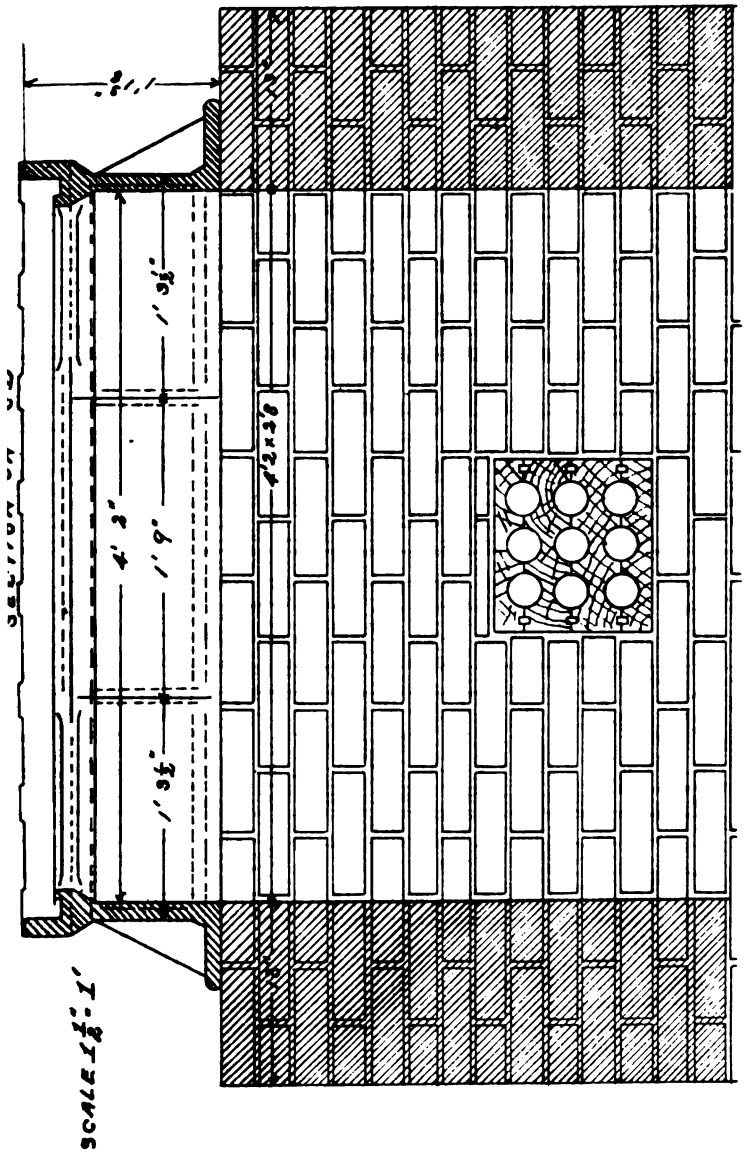
Fig. 3.



Longitudinal Section.

ate 10

American System



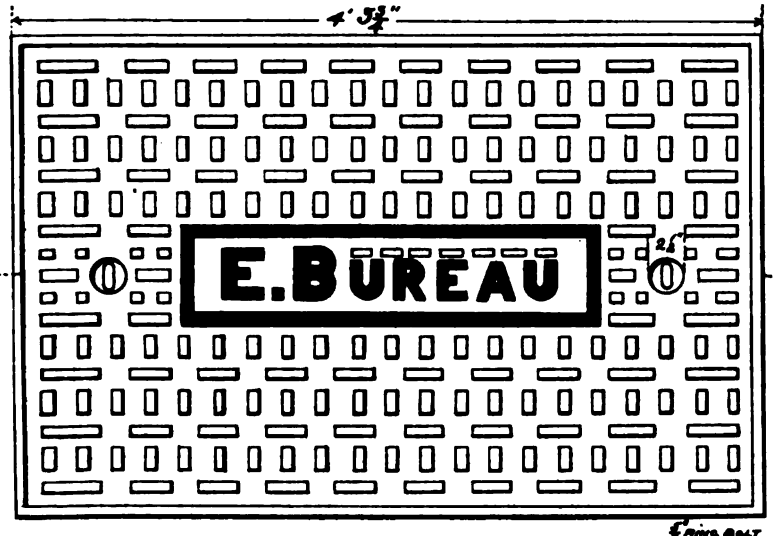
H Ex. 15. 52 1

Plate 11

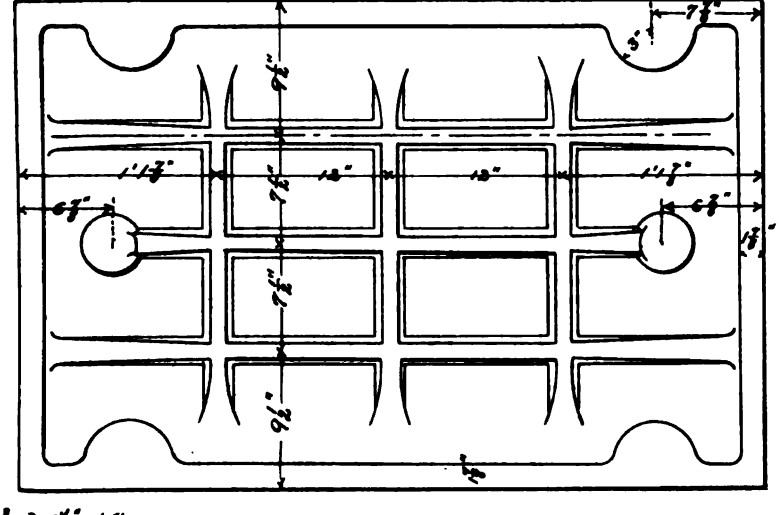
American System

MANHOLE CASTINGS
OF
PHILADELPHIA SYSTEM

TOP SIDE OF LID



Section on Line A-B



Scale 1½" = 1 ft.

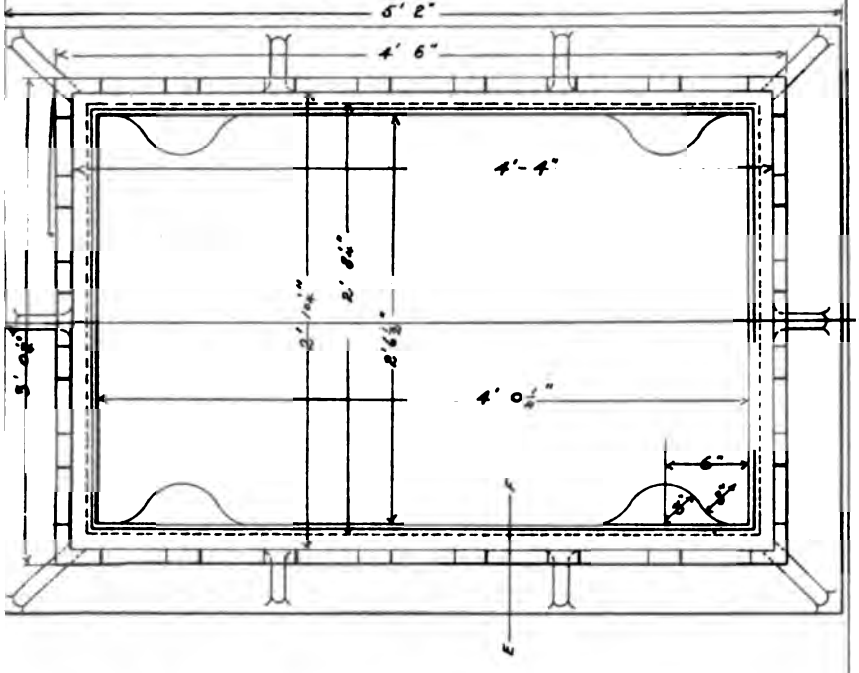
UNDER SIDE OF LID

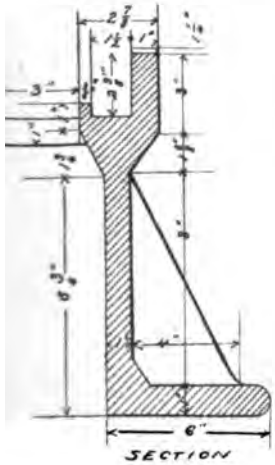
H Ex 16.....62 1

Plate 12

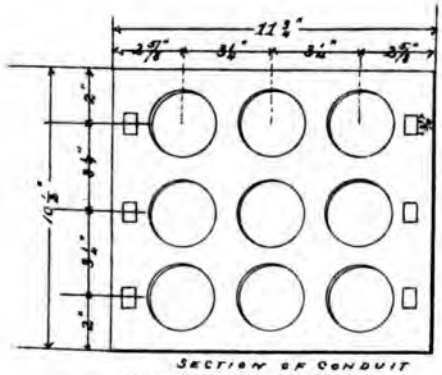
American System

PLAN OF FRAME





SECTION ON E.F. SCALE 3" = 1'

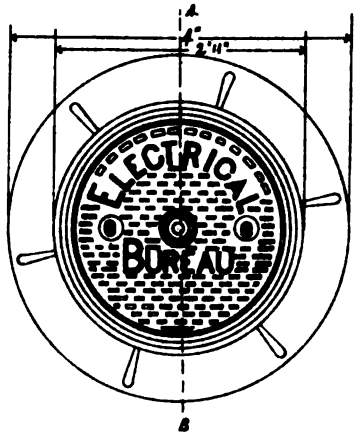


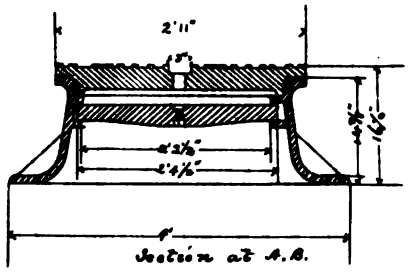
SECTION OF CONDUIT CREOSOTED YELLOW PINE.

SCALE 3" = 1'

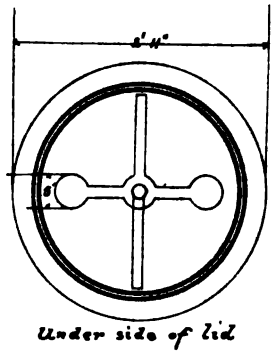
te 13

American System





Section at A.B.



Under side of lid

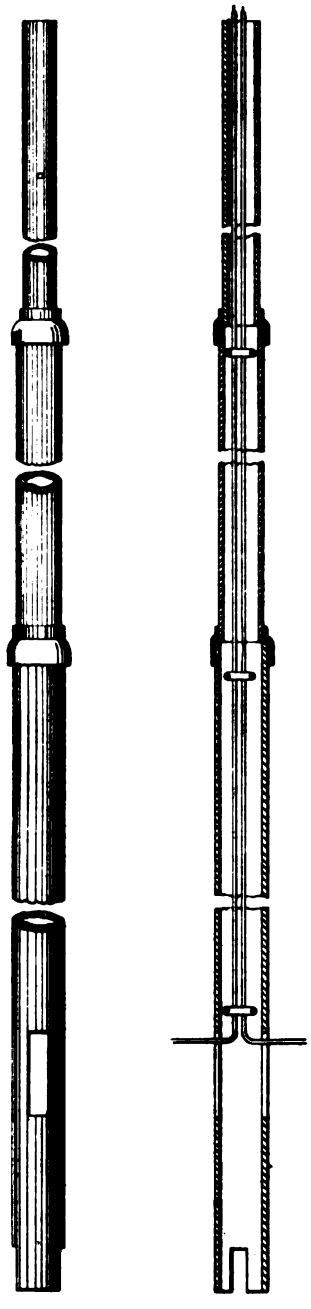


Plate 15

American System

INDURATED FIBRE PIPE SYSTEM

Fig. 1.

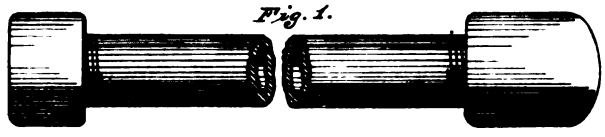
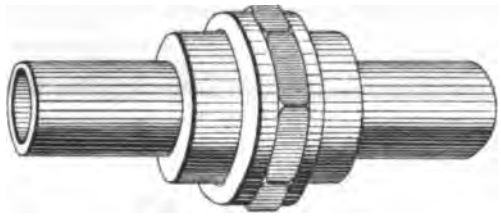


Fig. 2.



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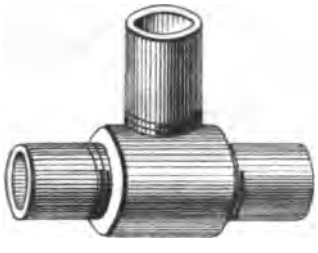

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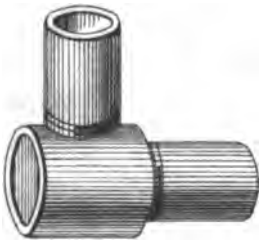

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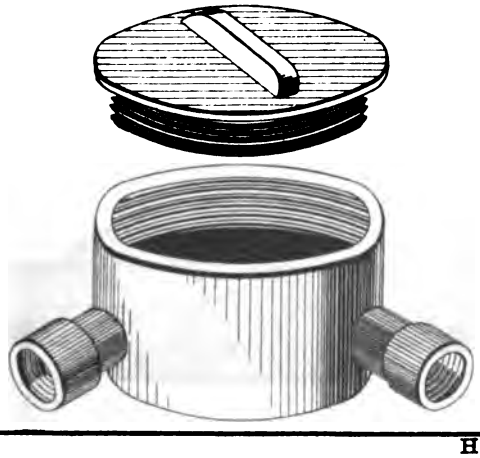


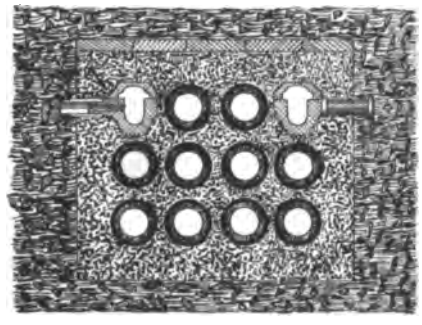
H Ex. 16....52 1

American System

te 16

WROUGHT IRON
CEMENT LINED PIPE SYSTEM

Fig. 1.



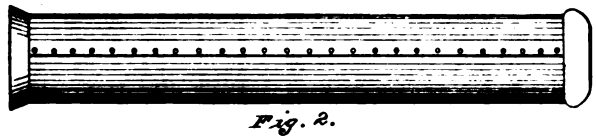


Fig. 2.

Fig. 3.

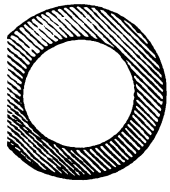


Fig. 4.

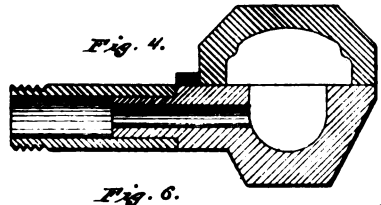


Fig. 6.

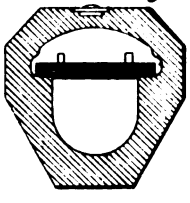


Fig. 6.

Fig. 7.

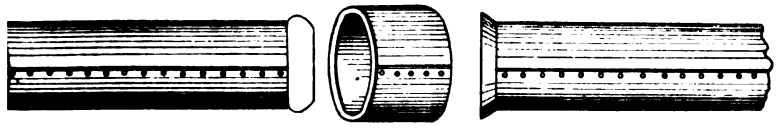
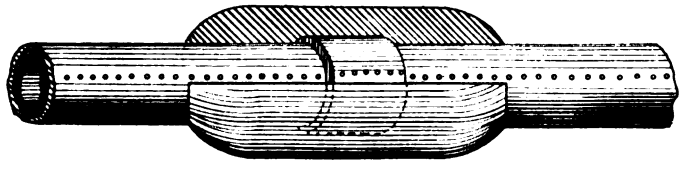


Fig. 8.

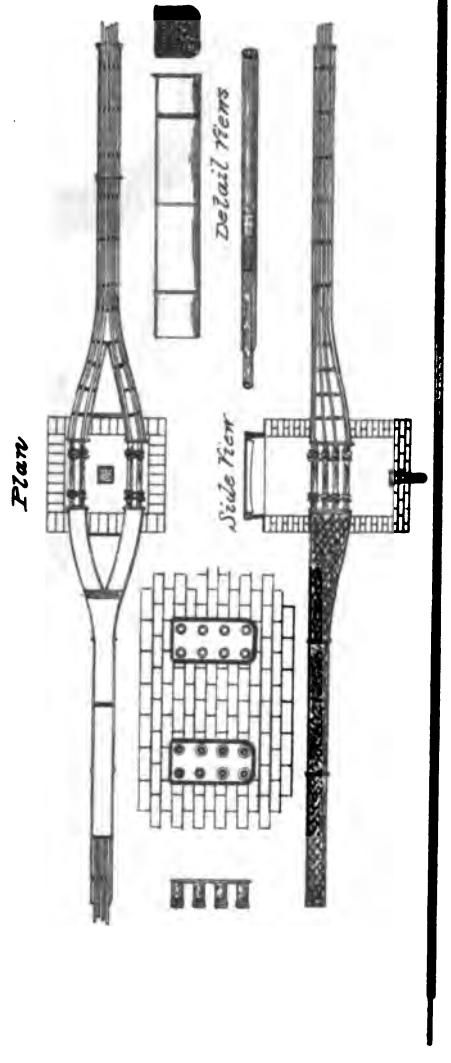


H Ex. 15 52 1

Plate 17

UNDERGROUND

INTERIOR CONDUIT & INSULATION SYSTEM



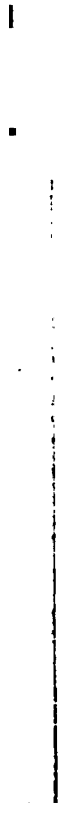
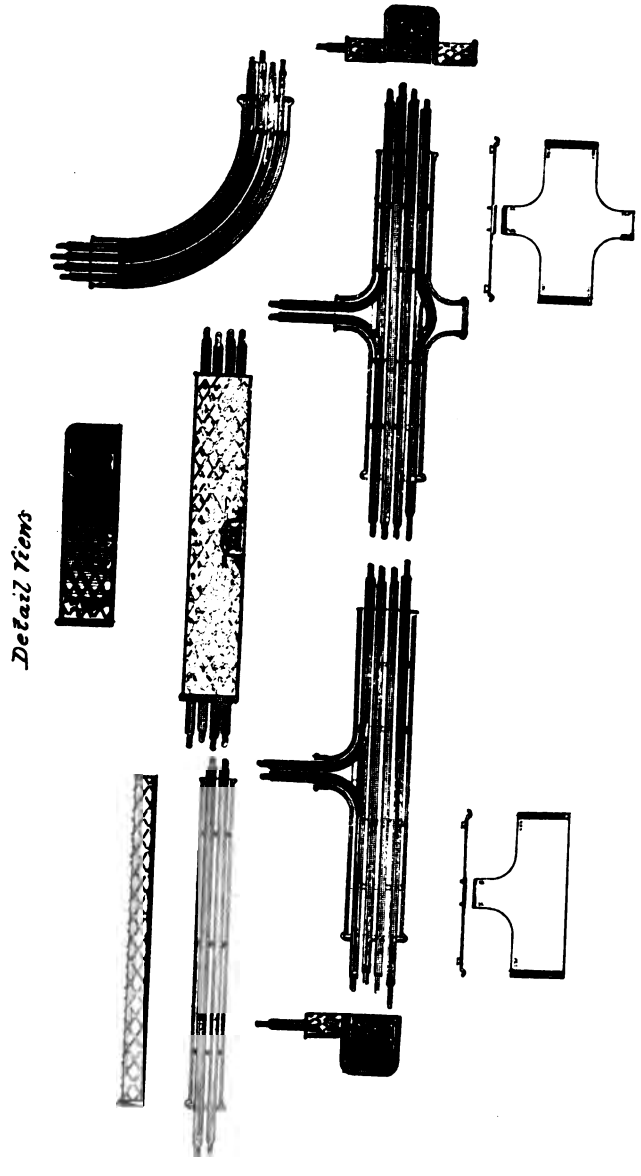


Plate 18



H Ex 16 52 1

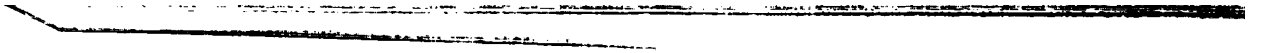
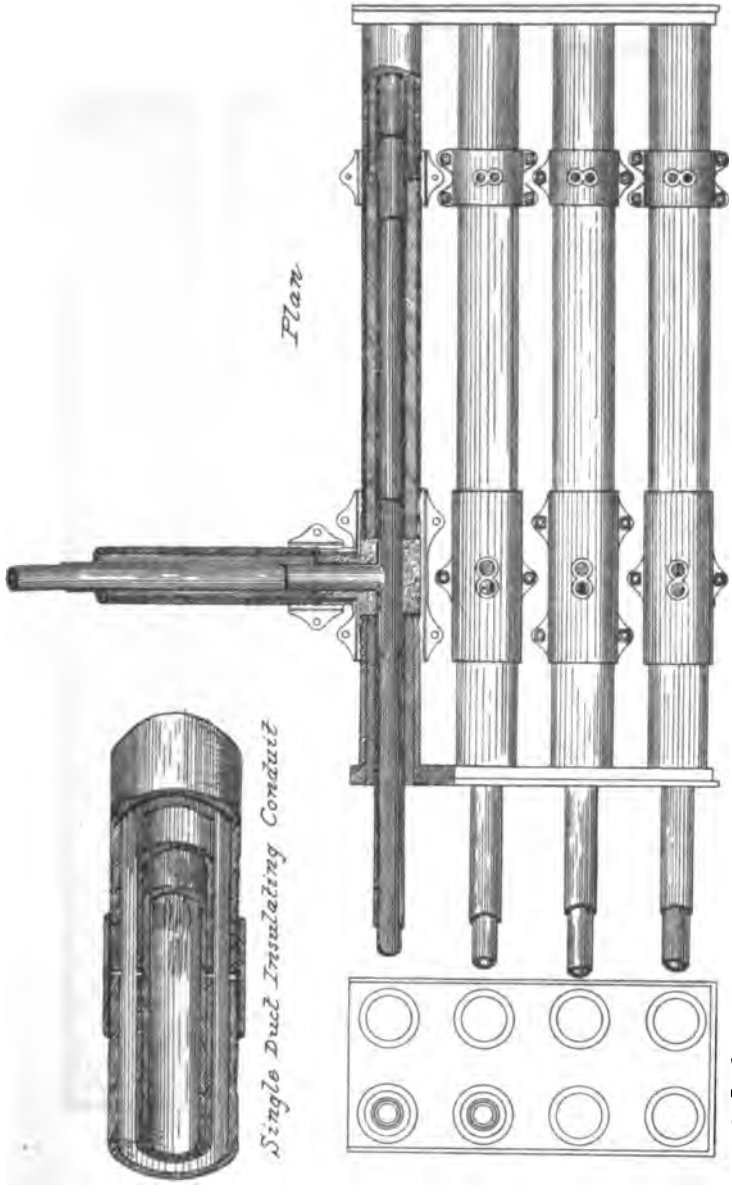
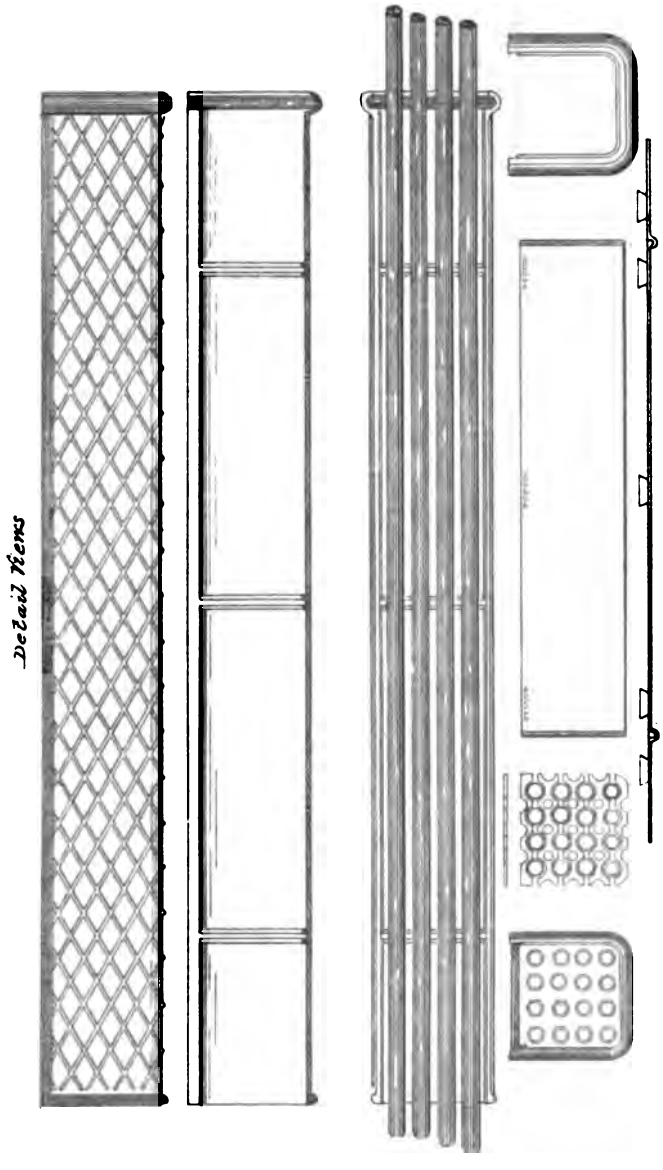


Plate 19



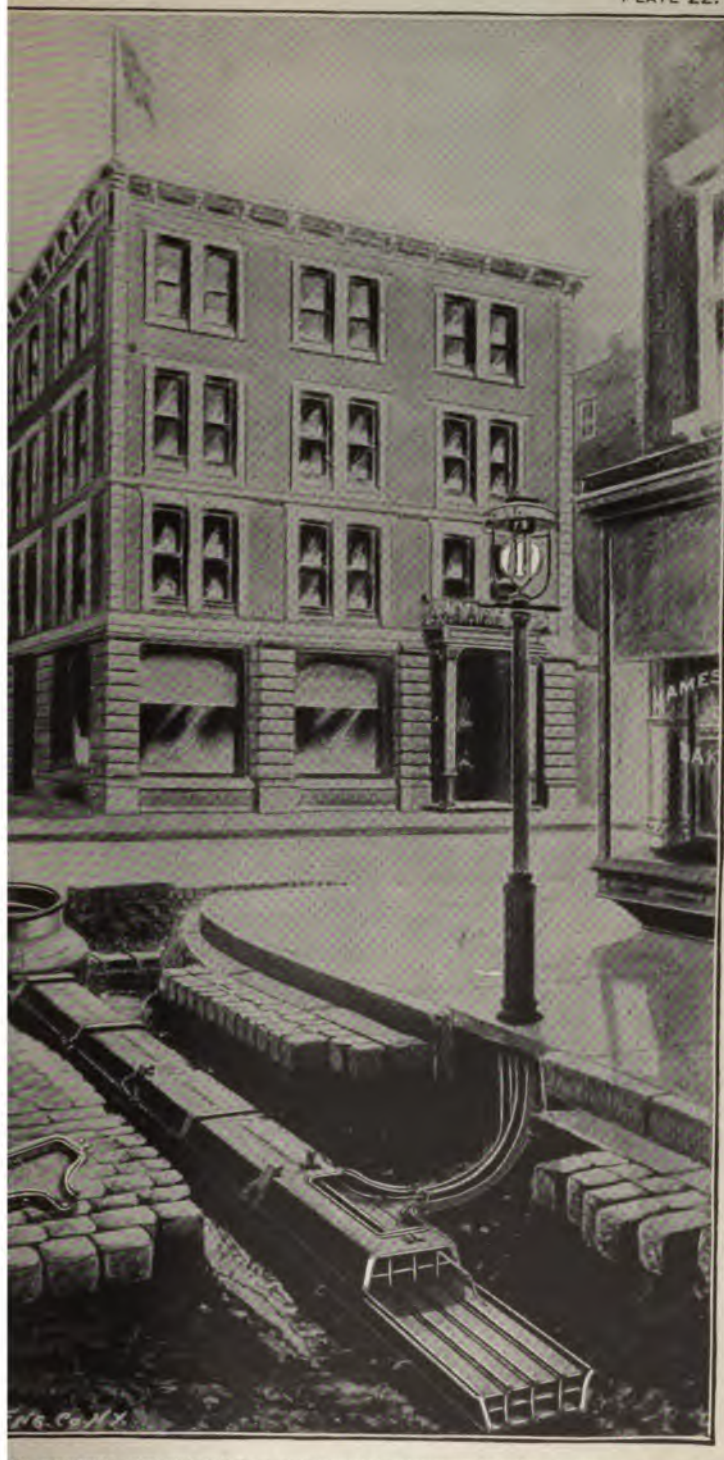
H Ex. 16. 52 1

Plate 20

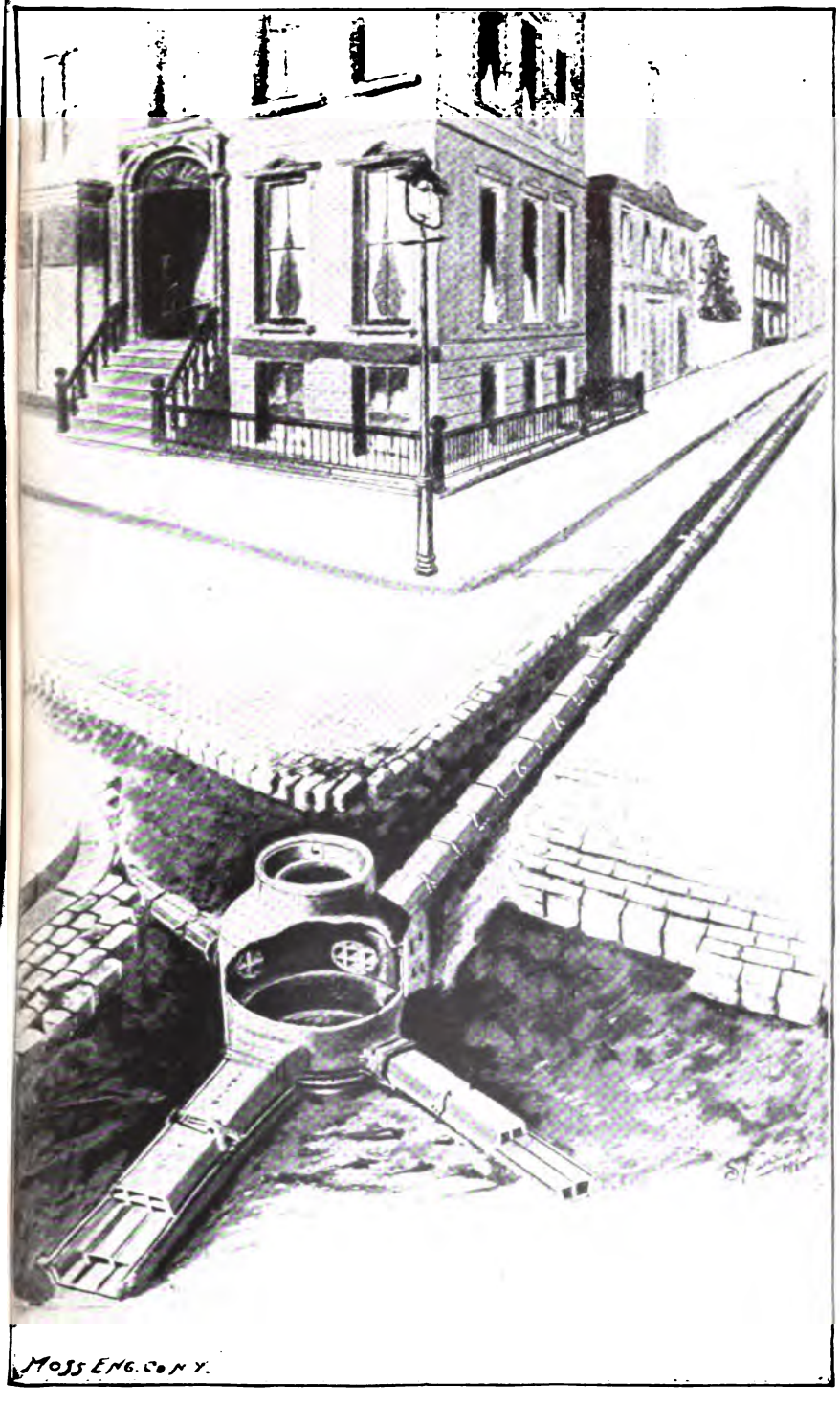


Detail Items

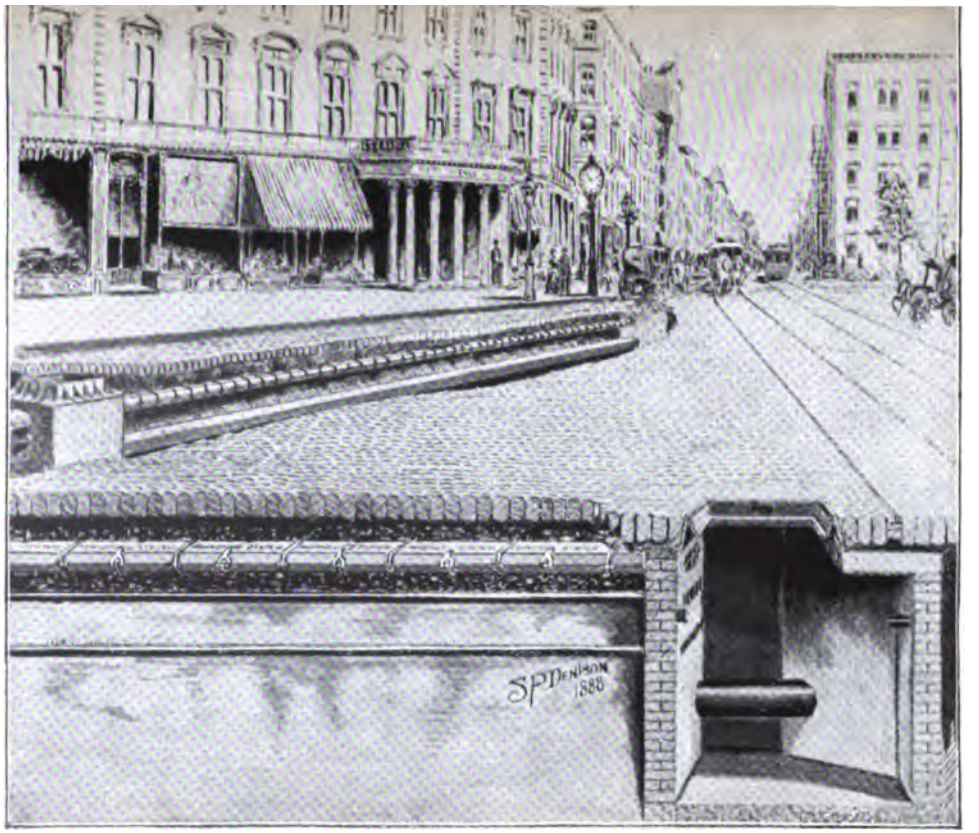
H Ex. 15 52 1



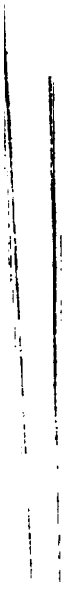
E SYSTEM OF SECTIONAL ELECTRIC UNDERGROUND CONDUITS USED
YORK CITY BY THE CONSOLIDATED TELEGRAPH AND ELECTRICAL
COMPANY.

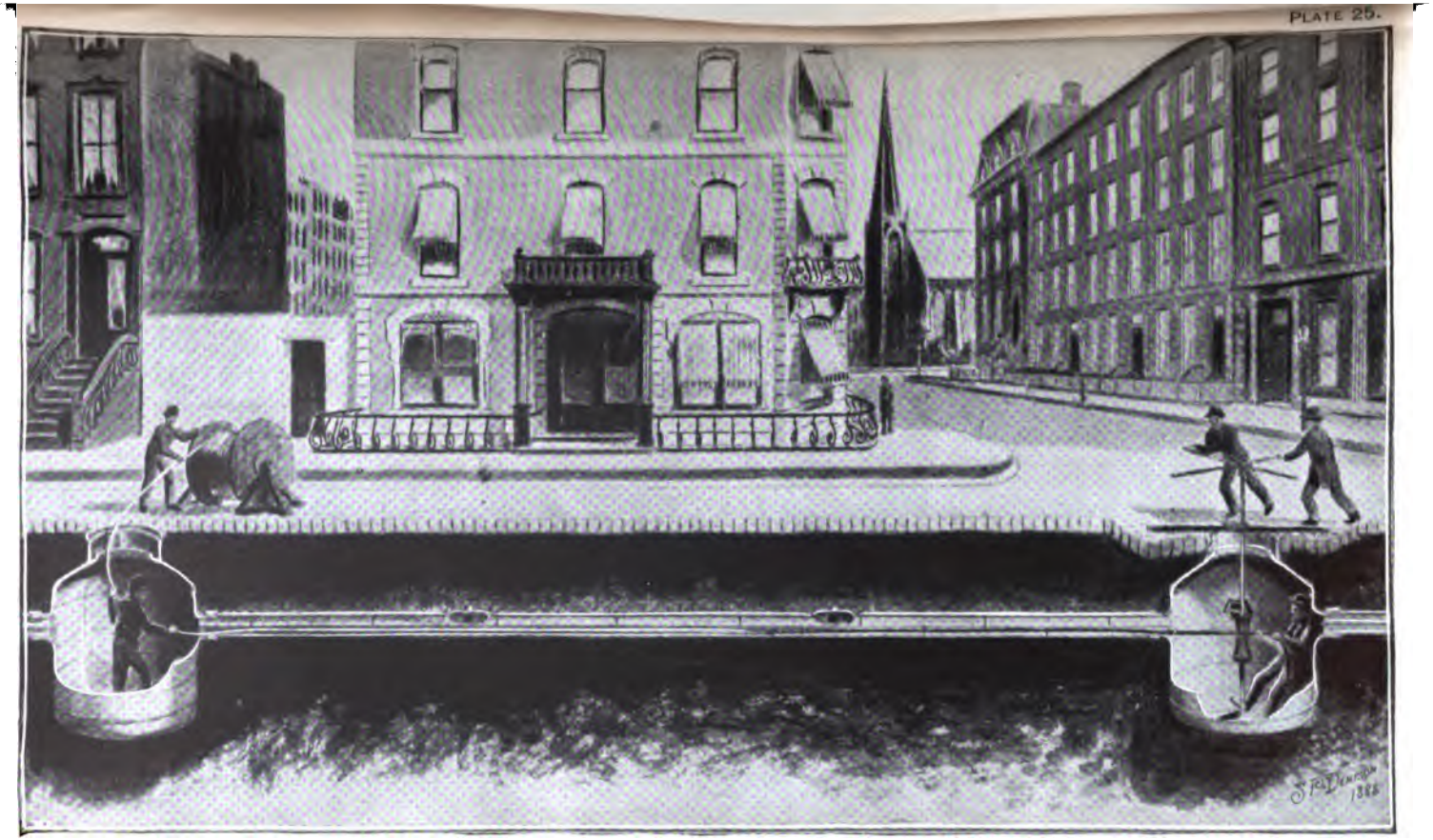


JOHNSTONE SYSTEM OF SECTIONAL ELECTRIC UNDERGROUND CONDUITS USED IN NEW YORK CITY BY THE CONSOLIDATED TELEGRAPH AND ELECTRICAL SUBWAY COMPANY.



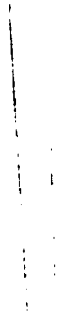
JOHNSTONE SYSTEM OF SECTIONAL ELECTRIC UNDERGROUND CONDUITS USED IN NEW YORK CITY BY THE CONSOLIDATED TELEGRAPH AND ELECTRICAL SUBWAY COMPANY.



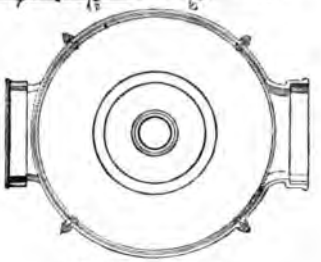


JOHNSTONE SYSTEM OF SECTIONAL ELECTRIC UNDERGROUND CONDUITS USED IN NEW YORK CITY BY THE CONSOLIDATED TELEGRAPH AND ELECTRICAL SUBWAY COMPANY.

NE SYSTEM, SHOWING MANHOLE AND ARRANGEMENT OF CABLES FOR SEC-
ELECTRIC UNDERGROUND CONDUITS, USED IN NEW YORK CITY BY THE
IDATED TELEGRAPH AND ELECTRICAL SUBWAY COMPANY.

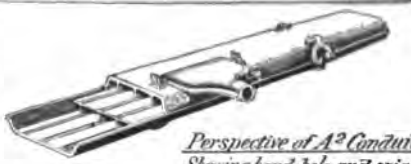


Johnstone System of Underground Conduits



Horizontal Section.

—Top View—



Perspective of A² Conduit
Showing hand-hole and spigot and arrangement of ducts.

Segment of middle ring
With outlet for A conduit.

A

A²

Segment of middle ring
With outlet for C conduit.

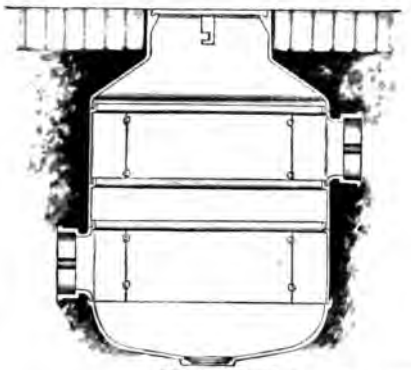
B

C

Segment of middle rings of Manhole.

D

E



Vertical Section of Manhole

Scale 1½"-1'0"

— Side View
Showing outlet of conduit.

S.P. Denison
N.Y. Aug. 1888.

European System

CALLENDER WEBBER SYSTEM

Descriptive section of roadway with Electric Mains amongst Gas and Water Mains

Fig. 1.

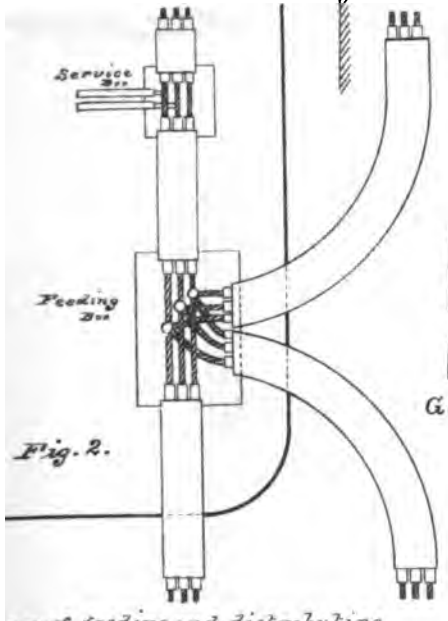
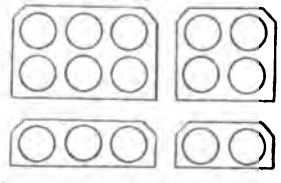


Fig. 2.

ram of feeding and distributing
ains with service and feeder box

Fig. 4.



General form of casing

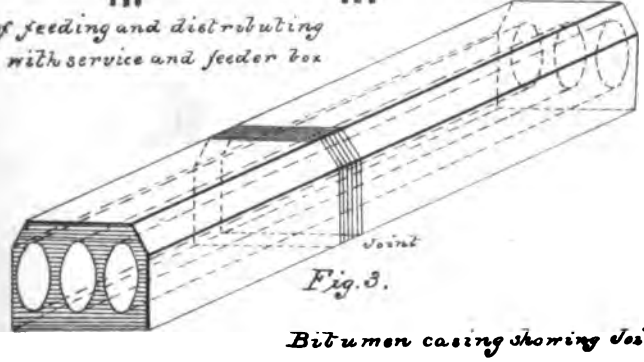


Fig. 3.

Bitumen casing showing Joint

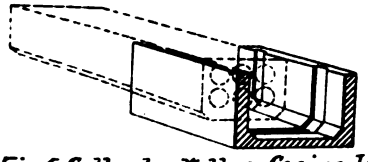


Fig. 6. Callender Weber, Casing Joint with saddle Piece

Fig. 6. Distributing Box

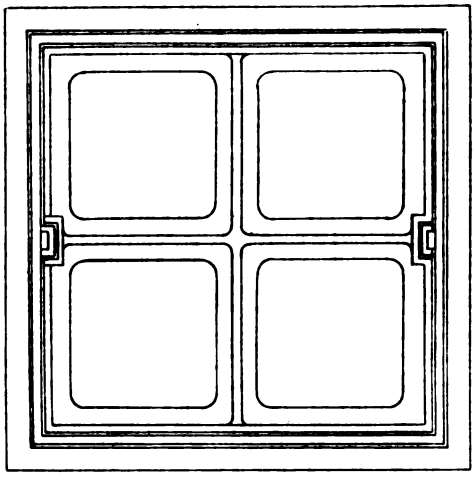


Fig. 7. Detail Coverplate

Plate 30

European System

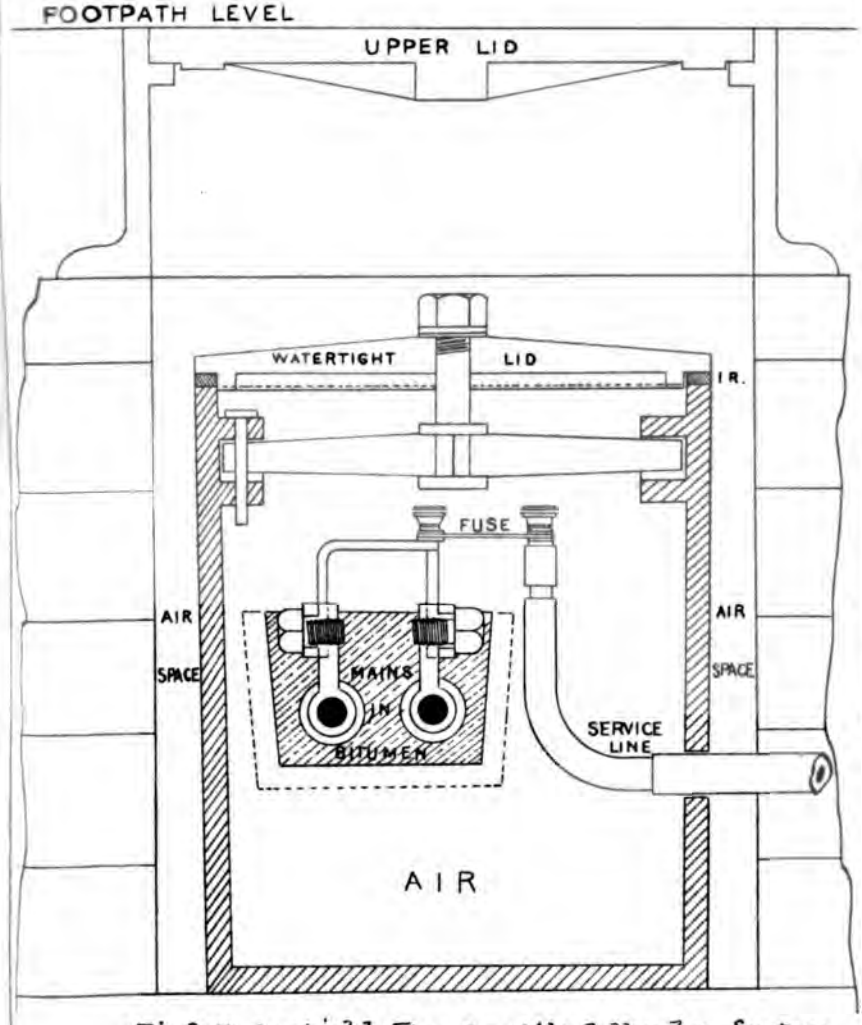


Fig. 8. Watertight Fuse Box of the Callender System

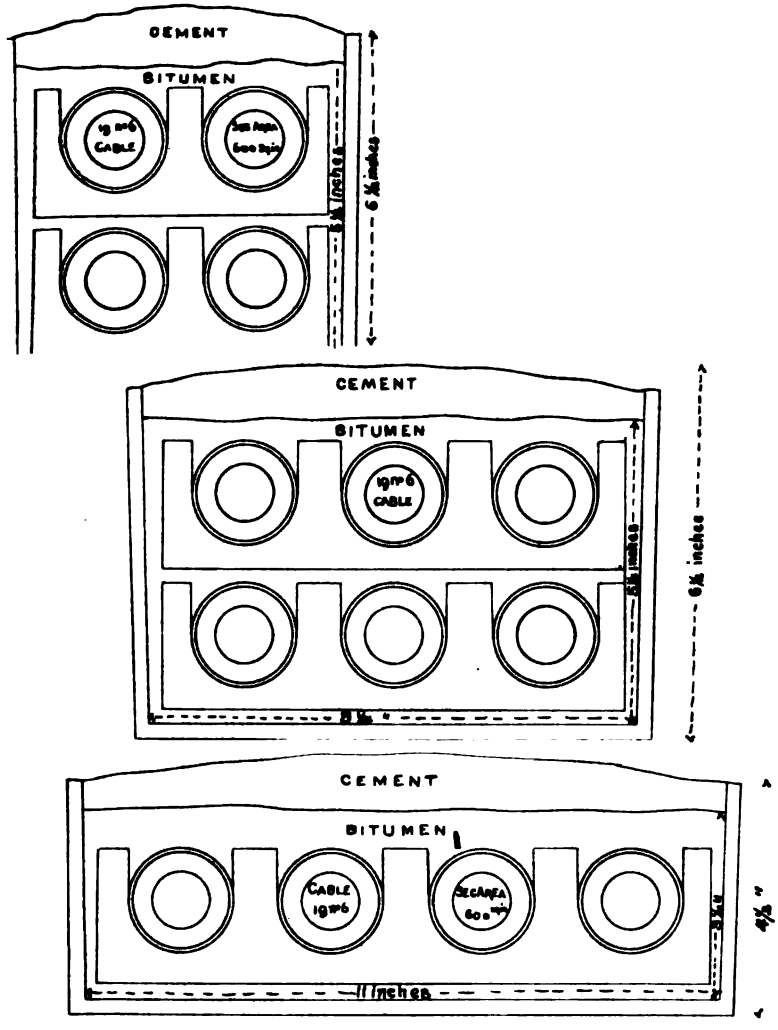


Fig. 1. Callender Solid System of underground Mains
Sections of 4 and 6 way mains in trough with cement.

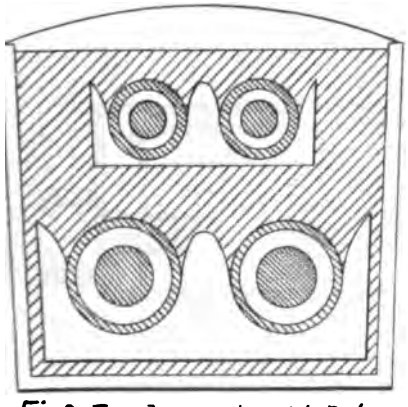


Fig. 2. Trough containing Distributers and Feeders

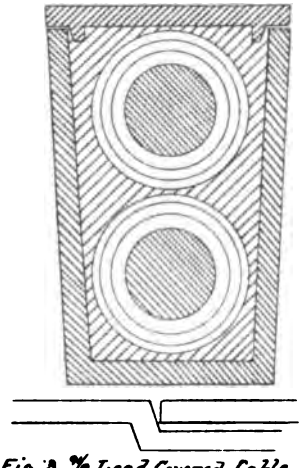


Fig. 3. ⅞ Lead Covered Cable ½ size

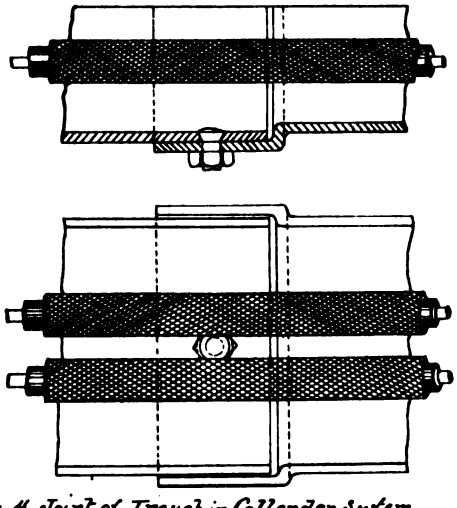


Fig. 4. Joint of Trough in Callender System ½ Size

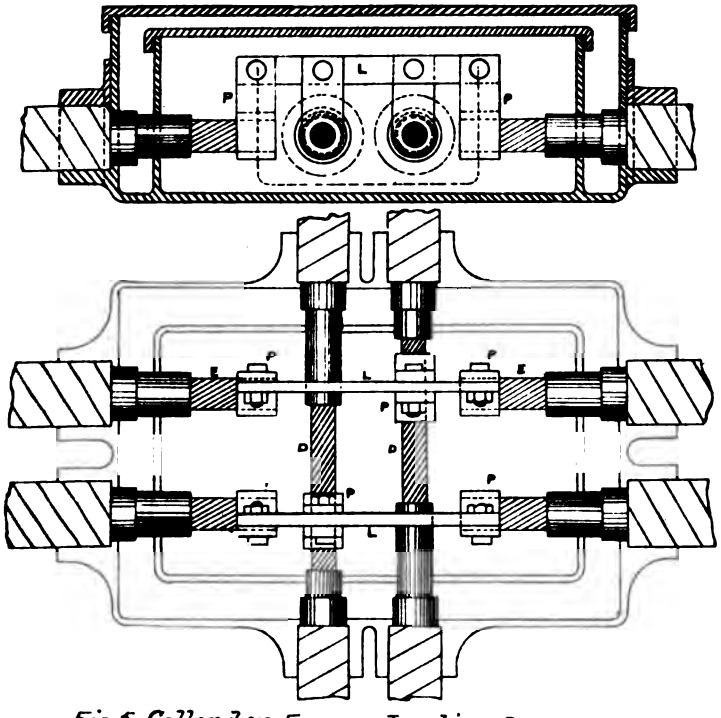
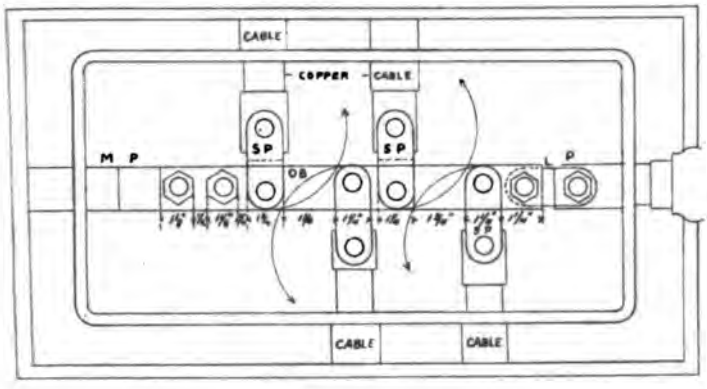


Fig.5. Callender Four way Junction Box Section and plan



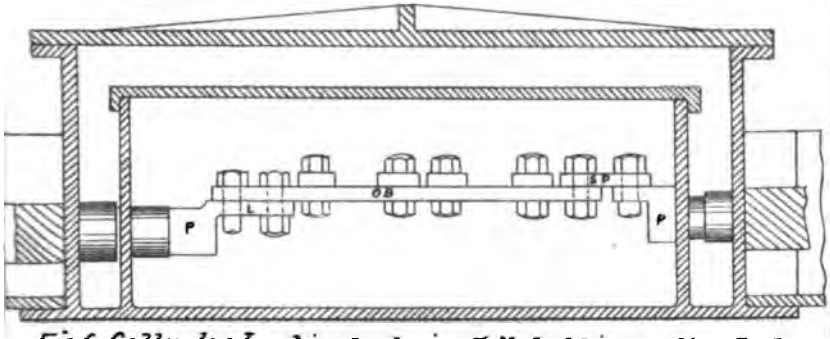


Fig.6. Callender Junction Box showing Method of Disconnecting Feeders Plan and section

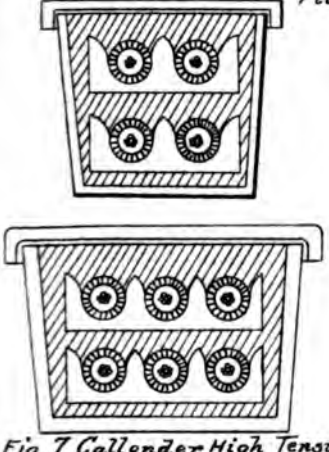


Fig. 7 Callender High Tension Cable

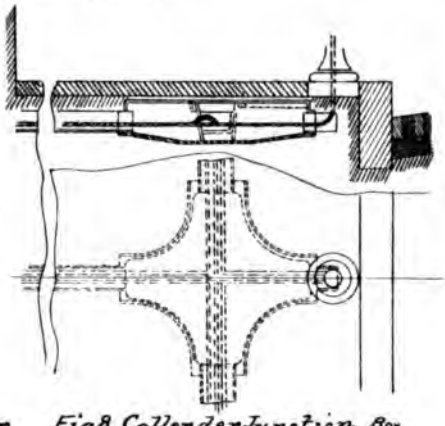


Fig.8. Callender Junction Box for Arc Lamps in Series

European System

THE CROMPTON SYSTEM

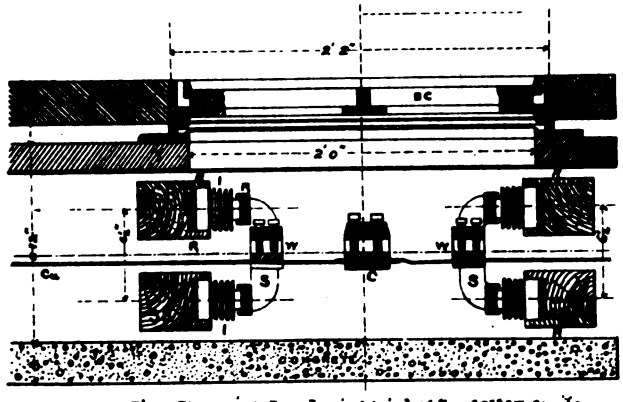


Fig 1. Straining Box, showing joint of two copper scrips

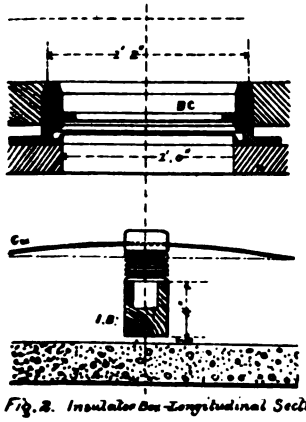


Fig. 2. Insulator Box-Longitudinal Section

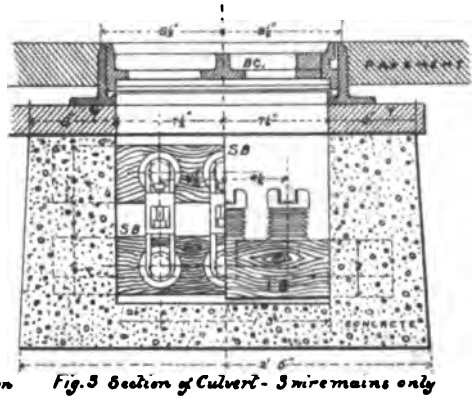


Fig. 3 Section of Culvert - 3 wire mains only

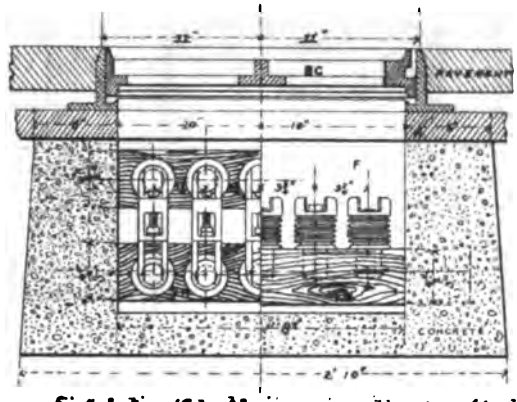


Fig. 4. Section of Culvert-3 wire mains with one pair of feeders

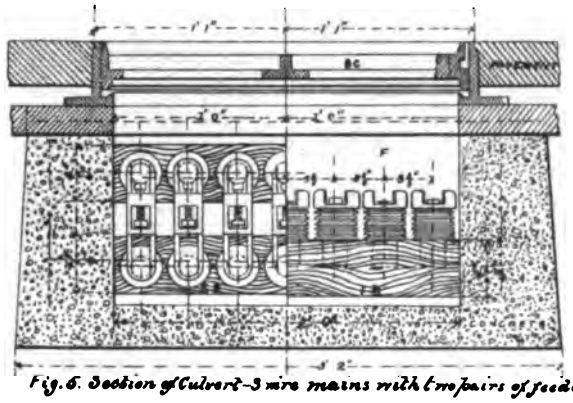


Fig. 5. Section of Culvert-3 wire mains with two pairs of feeders

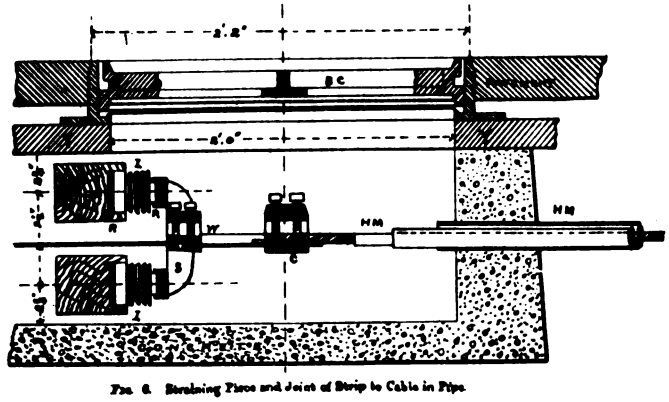


Fig. 6. Straining Piece and Joint of Strip to Cable in Pipe.

ate 37

European System

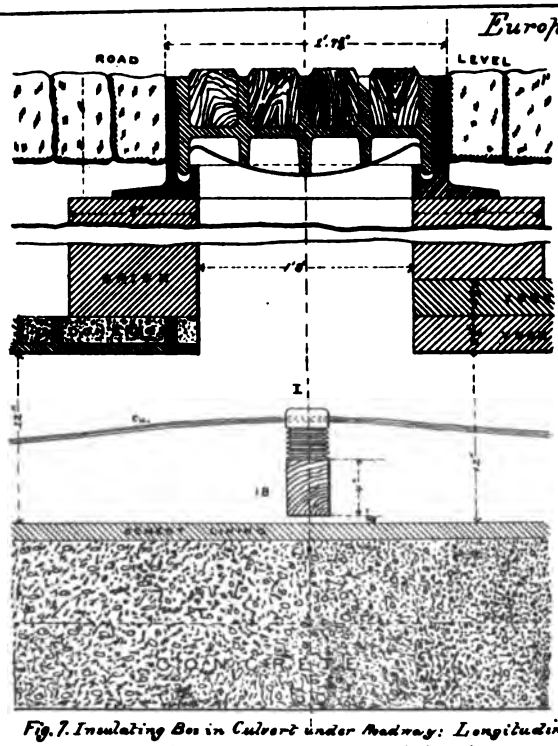


Fig. 7. Insulating Box in Culvert under Roadway: Longitudinal Section showing alternative systems with Yard or iron and concrete covering.

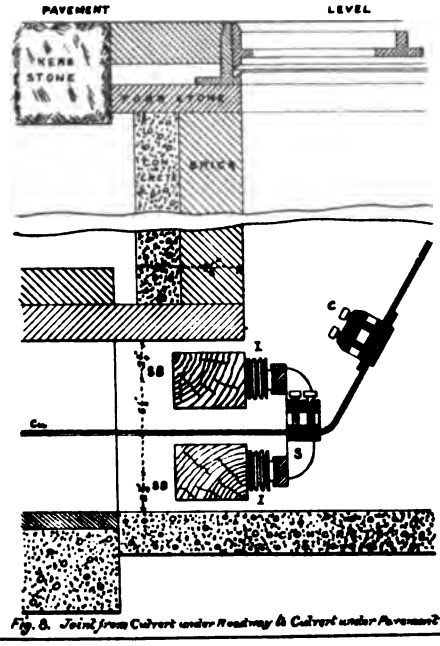


Fig. 8. Joint from Culvert under Roadway & Culvert under Pavement.

Plate 38

European System

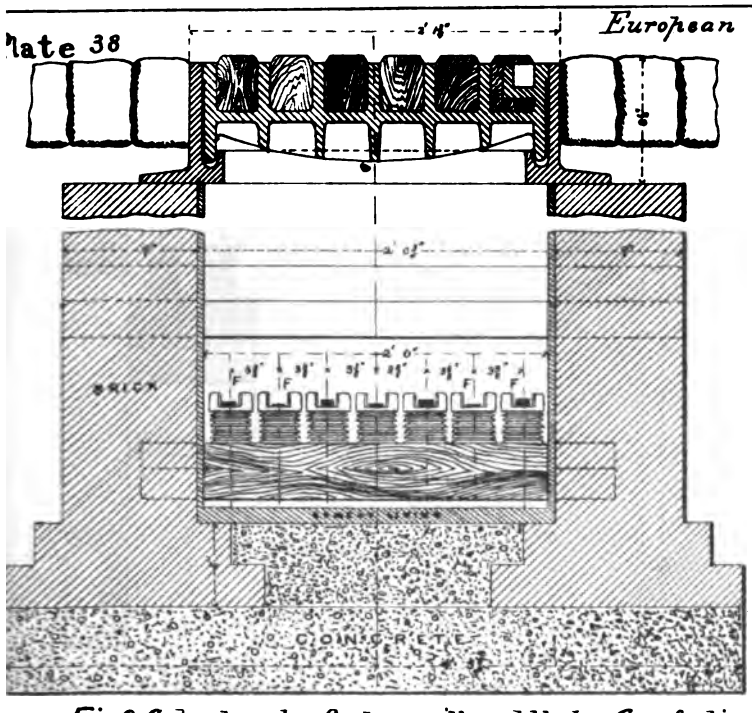


Fig. 9. Culvert under Roadway with wood blocks. Cross Section

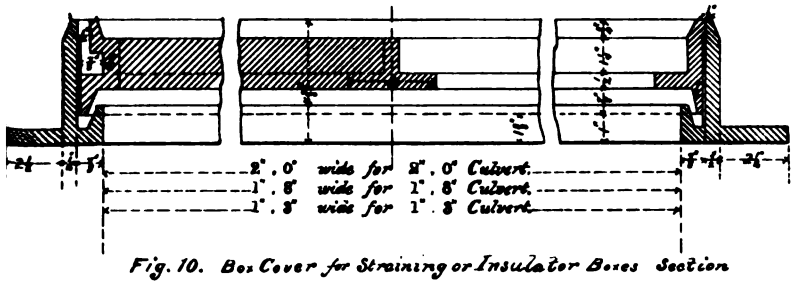


Fig. 10. Box Cover for Straining or Insulator Boxes Section

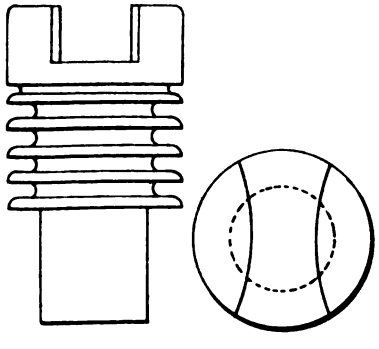


Fig. 11. Crompton Insulator

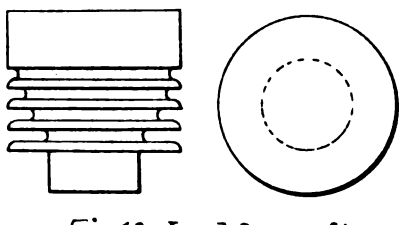


Fig. 12. Insulator for Straining

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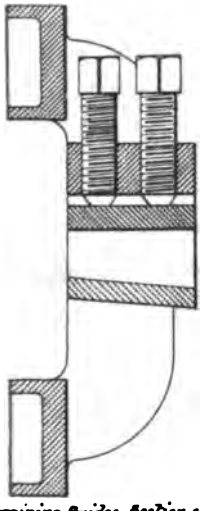


Straining Bridge, Section showing wedge shaped opening for gripping copper strips.

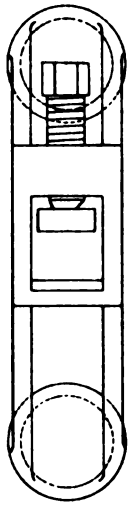


Fig. 14. Straining Piece
End view

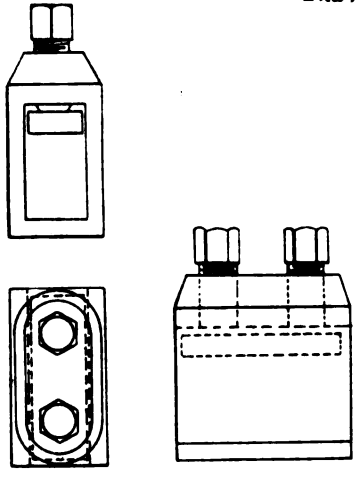


Fig. 15 Grip Busfor Connecting Copper Strips
Plan, end and side view

Brooks System

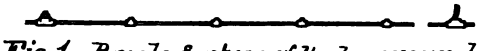


Fig. 1. Brooks System of Underground Cables in Iron Pipes

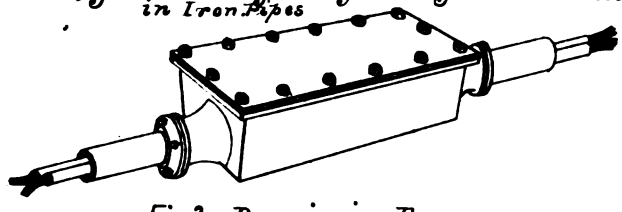
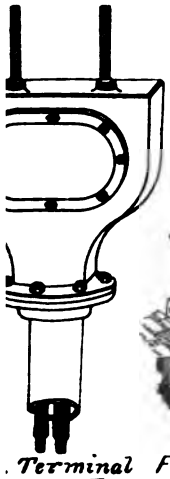


Fig. 2. Drawing in Box.



Terminal Box

Fig 6. Winch for Drawing in Cables

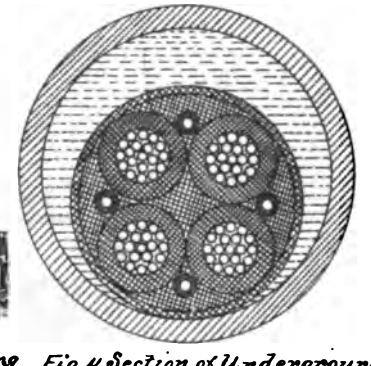
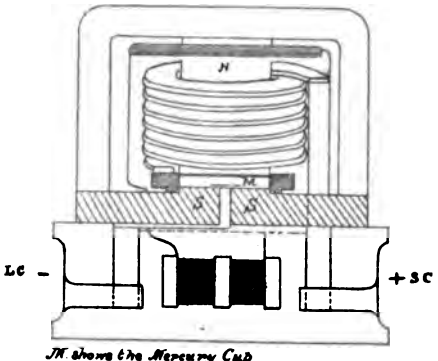


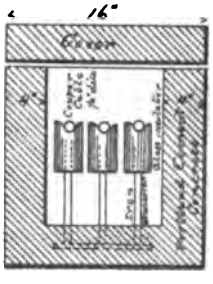
Fig. 4 Section of Underground Mains with oil Insulation

Fig. 6. Cauldron for Heating Brooks Cables



M shows the Mercury Cup
LC Lamp Circuit SC supply Circuit.

Fig. 1.



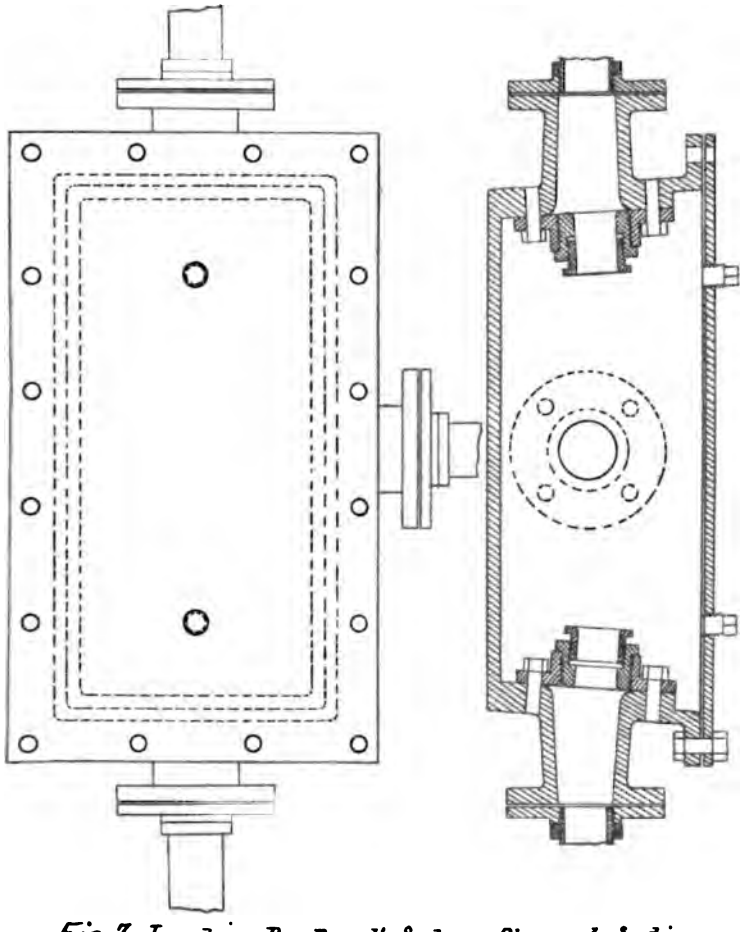


Fig. 7. Junction Box, Brook's System Plan and Section.

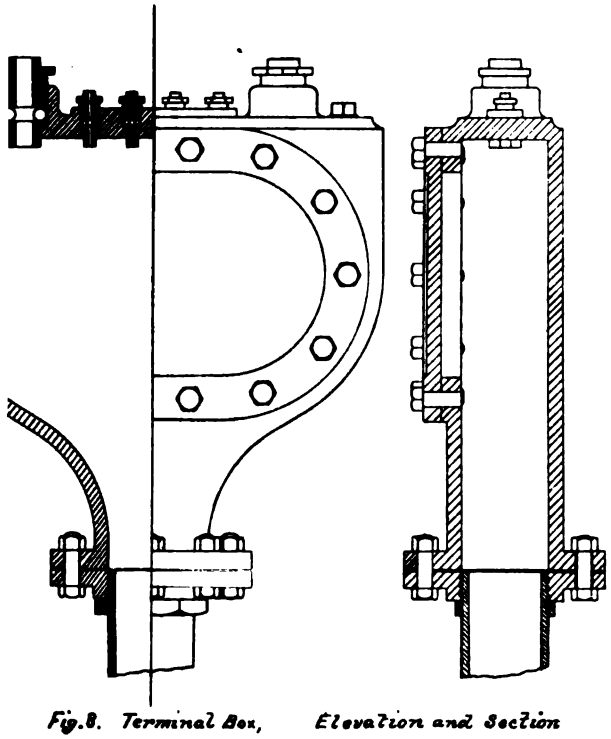


Fig. 8. Terminal Box, Elevation and Section

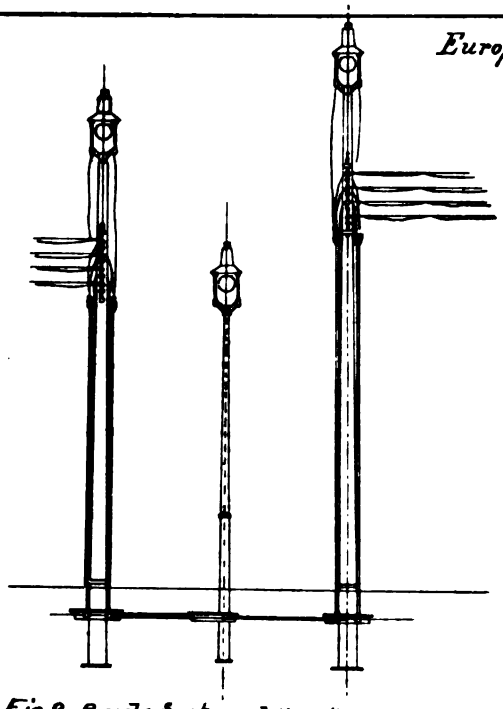


Fig. 9 Brooks System at Hong Kong
Overhead and Underground

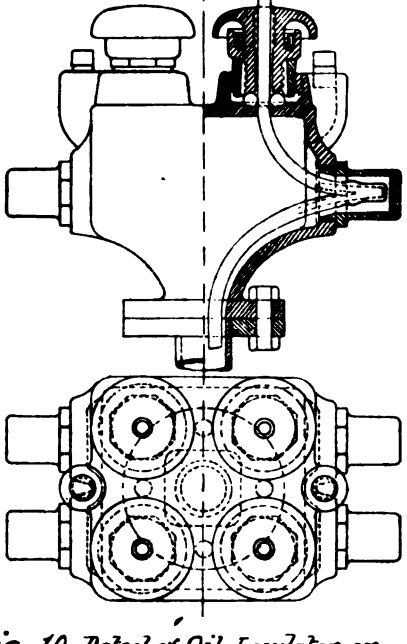


Fig. 10. Detail of Oil Insulator on Lamp Posts. Hong Kong.

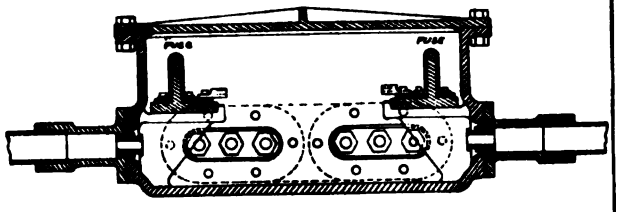
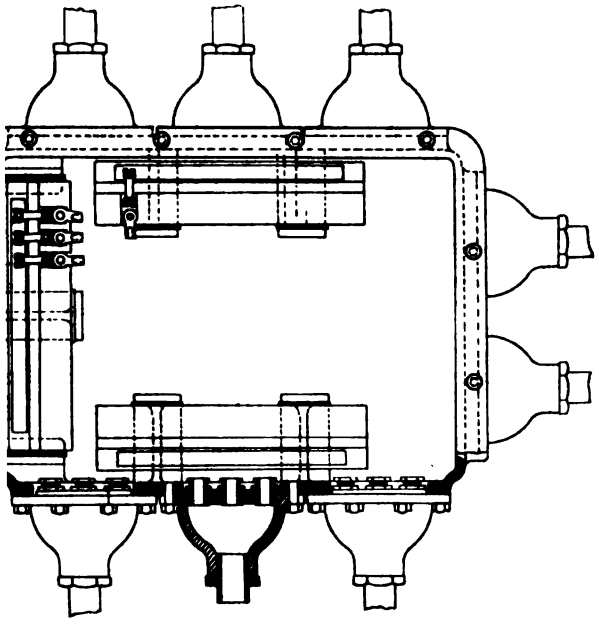
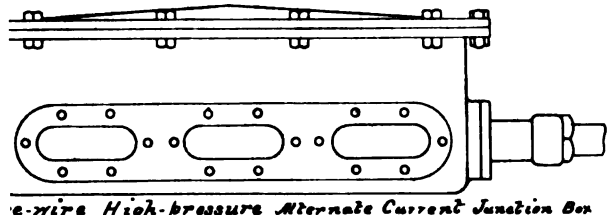


Fig. 12. Three-wire High Pressure Junction Box
End view and Section

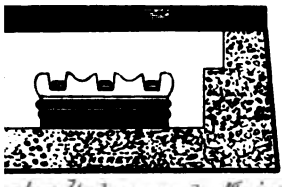




e-wire High-pressure Alternate Current Junction Box
Plan and Side Elevation

WESTMINSTER SYSTEM

Fig. 1.



ster Underground Mains

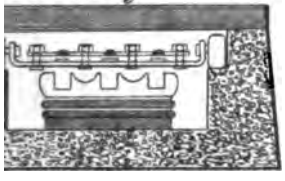


Fig. 2.

lley for Laying Mains

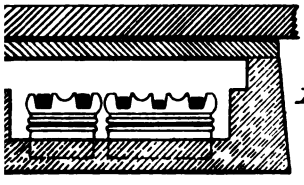


Fig. 3.

Mains and Feeders

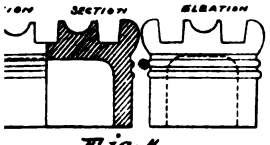


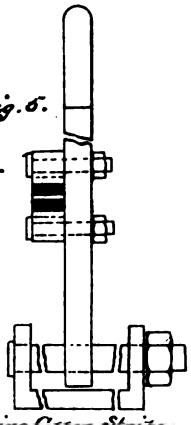
Fig. 4.

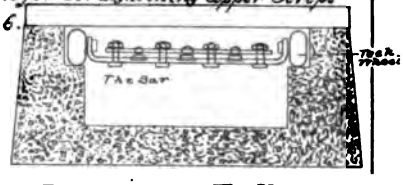
Westminster Insulators

Fig. 5.

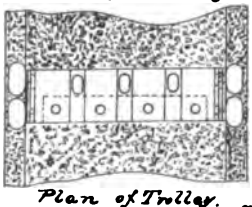
Tool for Straightening Copper Strips

Fig. 6.





End view of Trolley



Plan of Trolley.

Fig. 7.

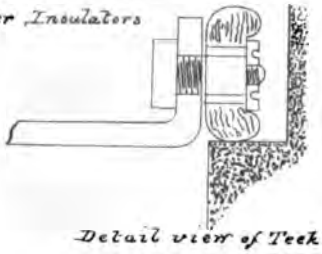


Fig. 8.

Detail view of Teek Wheel

FERRANTI SYSTEM

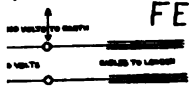


Fig. 1.

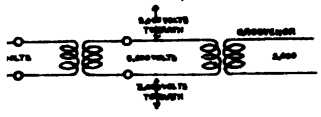
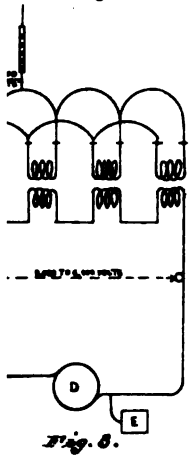


Fig. 2.



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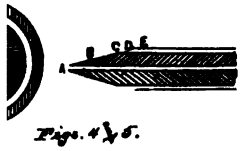
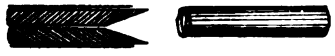


Figs. 4 & 5.

Fig. 6.

Fig. 7.



Figs. 8. and 9

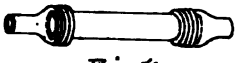


Fig. 10

Fig. 11.

Fig. 1.

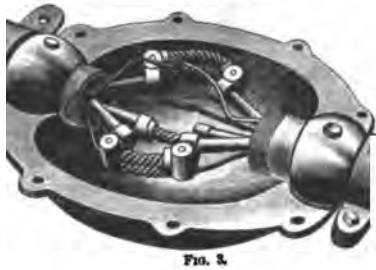


Fig. 3.

Fig. 4.

Fig. 5.

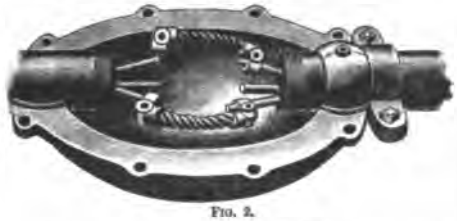


Fig. 2.

Fig. 9.

Fig. 8.

Fig. 7.

The Edison System of Underground Electric Tubes.

FIG. 10.

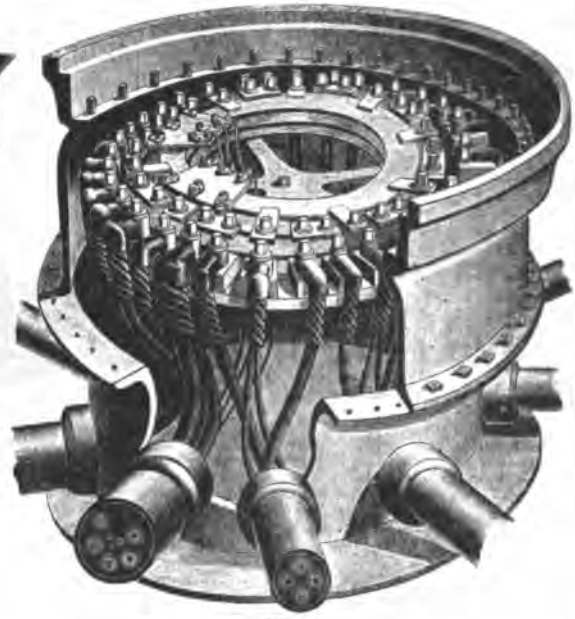


FIG. 14.

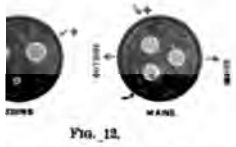


FIG. 12.

FIG. 15.

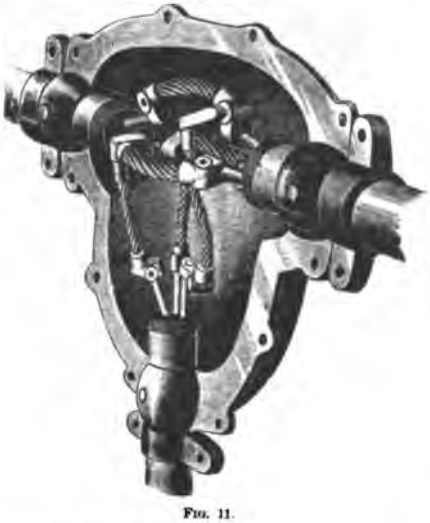
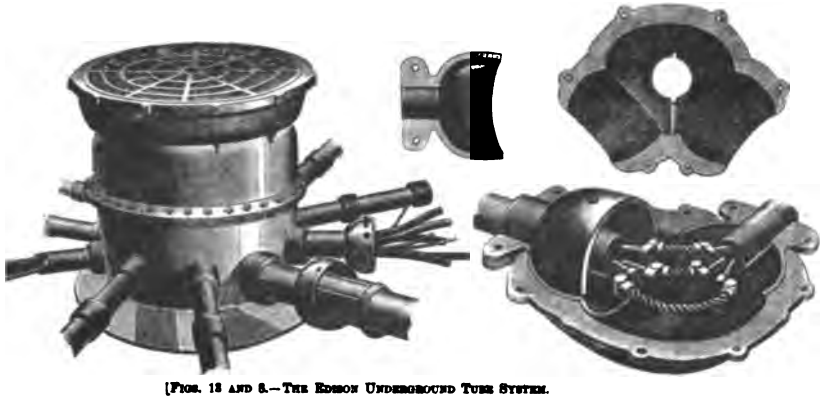


FIG. 11.

THE EDISON SYSTEM OF UNDERGROUND ELECTRIC TUBES.

FIG. 16.



[FIGS. 12 AND 8.—THE EDISON UNDERGROUND TUBE SYSTEM.

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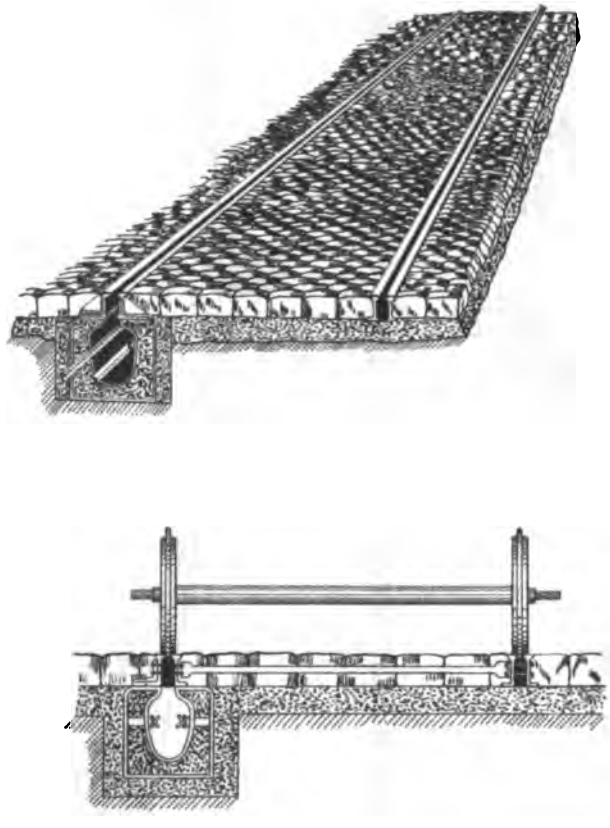
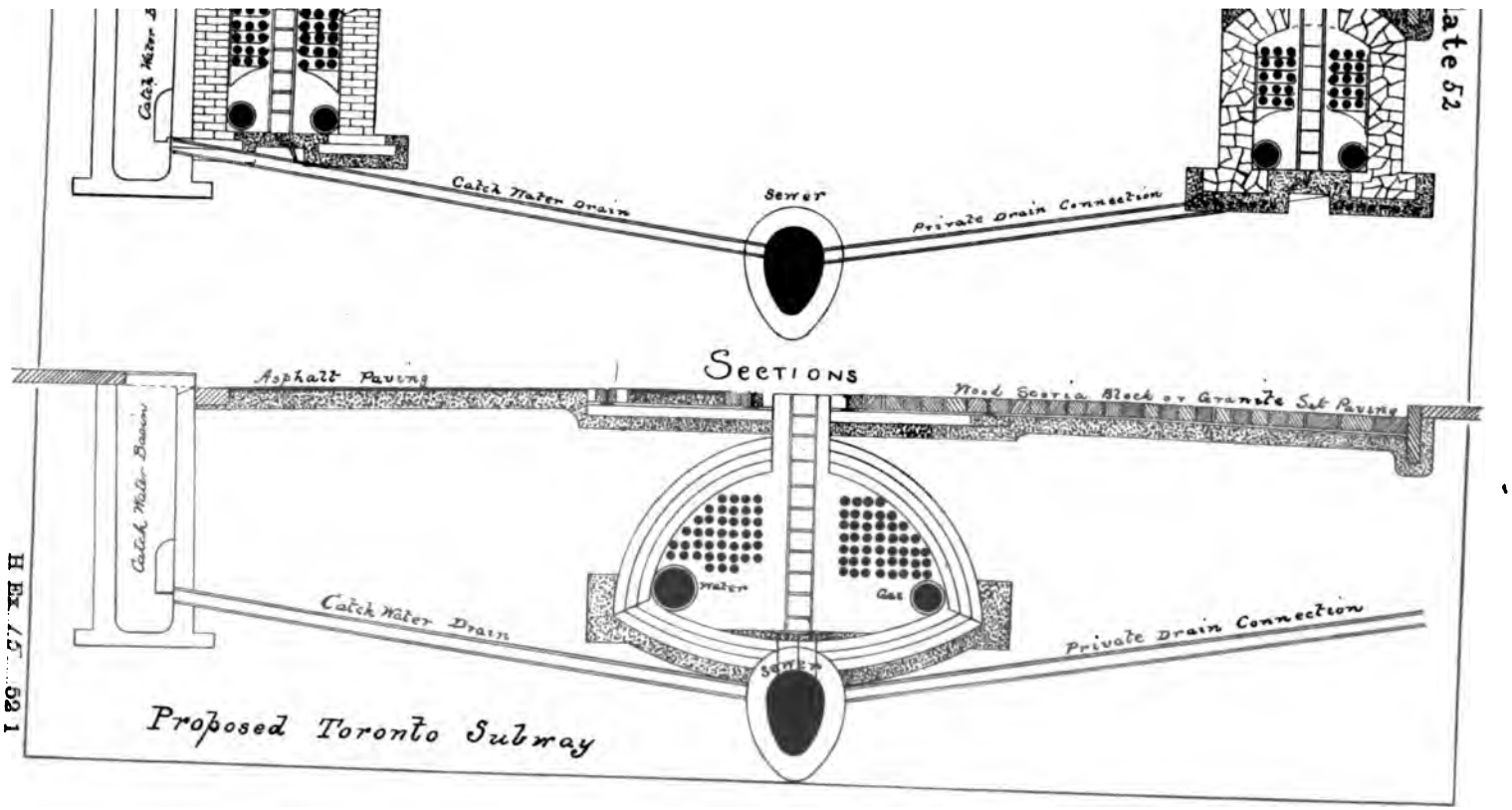
SECTIONAL VIEWS OF CONDUIT—BUDA-PESTH ELECTRIC RAILWAY.




Gas Water
Catch Water Drain
Sewer
Private Drain Connection
Sections
Asphalt Paving
Wood Scoria Block or Granite Set Paving
Catch Water Basin
Water
Gas
Catch Water Drain
Sewer
Private Drain Connection
Proposed Toronto Subway

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52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc. No. 16.

UNITED STATES BOARD ON GEOGRAPHIC NAMES.

MESSAGE

FROM THE

PRESIDENT OF THE UNITED STATES

TRANSMITTING

The report of the United States Board on Geographic Names.

JANUARY 5, 1892.—Referred to the Committee on Printing and ordered to be printed.

To the Senate and House of Representatives:

My attention having been called to the necessity of bringing about a uniform usage and spelling of geographic names in the publications of the Government, the following executive order was issued on the 4th day of September, 1890:

As it is desirable that uniform usage in regard to geographic nomenclature and orthography obtain throughout the Executive Departments of the Government, and particularly upon the maps and charts issued by the various Departments and Bureaus, I hereby constitute a Board on Geographic Names, and designate the following persons, who have heretofore coöperated for a similar purpose under the authority of the several Departments, bureaus, and institutions with which they are connected, as members of said Board:

Prof. Thomas C. Mendenhall, U. S. Coast and Geodetic Survey, chairman.
Andrew H. Allen, Department of State.
Capt. Henry L. Howison, Light-House Board, Treasury Department.
Capt. Thomas Turtle, Engineer Corps, War Department.
Lieut. Richardson Clover, Hydrographic Office, Navy Department.
Pierson H. Bristow, Post-Office Department.
Otis T. Mason, Smithsonian Institution.
Herbert G. Ogden, U. S. Coast and Geodetic Survey.
Henry Gannett, U. S. Geological Survey.
Marcus Baker, U. S. Geological Survey.

To this Board shall be referred all unsettled questions concerning geographic names which arise in the Departments, and the decisions of the Board are to be accepted by these Departments as the standard authority in such matters.

Department officers are instructed to afford such assistance as may be proper to carry on the work of this Board.

The members of this Board shall serve without additional compensation, and its organization shall entail no expense on the Government.

The report of the Board thus constituted has been submitted to me and is herewith transmitted for the information of Congress and with a view to its publication in suitable form, if such action is deemed by Congress to be desirable.

BENJ. HARRISON.

EXECUTIVE MANSION, *December 23, 1891.*

The PRESIDENT OF THE UNITED STATES:

SIR: The United States Board on Geographic Names, constituted under the executive order of September 4, 1890, has the honor to submit to you herewith its first report:

ORIGIN AND HISTORY.

The necessity for a Board for inducing uniform usage and spelling of geographic names in the publications of the Government has long been apparent.

There are several bureaus and departments engaged in the construction of maps and charts, and the publication and dissemination of geographic information. Prominent among them are the Coast and Geodetic Survey, which is making charts of the coasts of the United States, the Hydrographic Office of the Navy Department, from which emanate charts of foreign coasts, the Geological Survey, which is making a mother map of the United States, the General Land Office, which compiles from its plats maps of most of the States and Territories, the Post-Office Department, which decides the names of all post-offices, etc. Besides these there is scarcely a bureau of the General Government which does not have occasion in its reports and other papers to use geographic names, to a greater or less extent.

It is well known that there have existed among these bureaus differences of usage concerning geographic names. Indeed, even among different publications of the same bureau, usage has not been uniform. It has frequently occurred that the same bureau has used different forms at different times and in different publications. In the winter of 1889 and 1890 this matter became a subject of conference among a few of those most deeply interested, and it was decided to attempt the removal of a serious and growing evil in the publications of the Government. With this purpose in view, a voluntary association of representatives of some of the bureaus interested was formed early in the spring for the purpose of considering and deciding upon the proper names or the spelling to be adopted in such cases as should be brought before it, and thus gradually to bring about uniformity in the publications of the bureaus represented in respect to geographic names.

There were represented in this association the Coast and Geodetic Survey, the Hydrographic Office, the Geological Survey, the Light-House Board, the Smithsonian Institution, the Departments of State and War, and the Post-Office Department.

After several meetings, in which much was done in the way of determining methods of procedure and adopting general principles for guidance, as well as the consideration and decision of more than a hundred cases, it was recognized that the importance of the work of the association and the difficulties of an administrative character which might be anticipated, required that its organization should be strengthened. Under these circumstances executive authority could alone secure adoption in all Government publications of the decisions of the association. The matter was therefore brought to your attention and the association was clothed with the necessary authority by the following

EXECUTIVE ORDER.

As it is desirable that uniform usage in regard to geographic nomenclature and orthography obtain throughout the Executive Departments of the Government, and particularly upon the maps and charts issued by the various Departments and bureaus, I hereby constitute a Board on Geographic Names, and designate the following

rsons, who have heretofore coöperated for a similar purpose under the authority the several Departments, bureaus, and institutions with which they are connected, members of said Board:
Prof. Thomas C. Mendenhall, U. S. Coast and Geodetic Survey, chairman.
Andrew H. Allen, Department of State.
Capt. Henry L. Howison, Light-House Board, Treasury Department.
Capt. Thomas Turtle, Engineer Corps, War Department.
Lieut. Richardson Clover, Hydrographic Office, Navy Department.
Pierson H. Bristow, Post-Office Department.
Otis T. Mason, Smithsonian Institution.
Herbert G. Ogden, U. S. Coast and Geodetic Survey.
Henry Gannett, U. S. Geological Survey.
Marcus Baker, U. S. Geological Survey.
To this Board shall be referred all unsettled questions concerning geographic names hich arise in the Departments, and the decisions of the Board are to be accepted by ese Departments as the standard authority in such matters.
Department officers are instructed to afford such assistance as may be proper to rry on the work of this Board.
The members of this Board shall serve without additional compensation, and its ganization shall entail no expense on the Government.

BENJAMIN HARRISON.

EXECUTIVE MANSION, *September 4, 1890.*

Under this authority the Board has held seventeen meetings. It has lopted a code of by-laws for regulating the transaction of business, as agreed upon certain general principles for guiding its decisions, id has decided about 2,000 cases.
The by-laws under which its proceedings have been carried on are as llows:

BY-LAWS.

I.—*Name.*

This organization shall be called "The United States Board on Geographic Names."

II.—*Officers of the Board.*

The officers shall consist of a chairman, a secretary (who shall be elected by ballot), id an executive committee of three to be appointed by the chair with the concurnce of the Board, all of whom shall serve for one year or until their successors shall chosen.

III.—*Duties of officers.*

(*a*) The chairman shall preside at the meetings and shall certify to the decisions the Board. He shall appoint all committees not specially named by the Board. e shall have power to designate a member of the Board to act for him during his mporary absence.
(*b*) The secretary shall record the proceedings of the Board and shall keep a record iat will show the decisions rendered, or other action of the Board upon cases subitted to it, with reference to the papers filed in each case. He shall maintain files f the original papers, or copies of them, that may be presented in each case, conveniently arranged for reference. He shall conduct the general correspondence and hall receive communications presented for the consideration of the Board, transitting them to the executive committee as their character may require or as may e hereafter provided.
(*c*) The executive committee shall receive through the Secretary all communicaions requiring decision by the Board, shall investigate the questions presented, seuring information from all available sources, and shall report upon them to the Board, ubmitting recommendations regarding them.

IV.—*Meetings.*

The Board shall hold regular meetings on the first Tuesday in each month, excepng the months of July, August, and September. Special meetings may be called by he chairman or by the executive committee. A majority of the Board shall constiute a quorum. The affirmative vote of a majority of all the members of the Board hall be required in the final decision in any case. All motions presented for the onsideration of the Board shall be submitted in writing.

V.—*Amendments.*

These by-laws may be amended at any regular or special meeting, by a majority vote of all the members of the Board, provided that the proposed amendment has been presented at least four weeks previous to the time the vote is taken.

WASHINGTON, D. C., adopted November 4, 1890.

Under these by-laws the Board was organized with Prof. T. C. Mendenhall as chairman, as provided for in the Executive order, the election of Lieut. Commander Richardson Clover as secretary, and the appointment of Messrs. Henry Gannett, Richardson Clover, and H. G. Ogden as executive committee.

WORK DONE.

The necessity of this Board has already been amply demonstrated. During this, its first year, there have been submitted to it more than 2,000 questions and decisions have been rendered in nearly all of these cases. Shortly after it was organized it was called upon to render decisions concerning several hundred names in Alaska, where the utmost confusion exists regarding geographic names. In this region the difficulties of transliteration of Russian and Indian names into English characters are complicated by the fact that expedition after expedition visiting this region has assigned different sets of names to its geographic features. The difficulties encountered in settling the questions submitted relative to Alaskan names made it apparent that nothing short of a complete revision of the geographic nomenclature of Alaska would be satisfactory. Accordingly the Board, having decided the cases submitted to it, is now engaged in making such a revision, the result of which will be to furnish a geographic dictionary of the Territory.

The Lighthouse Board and the Coast and Geodetic Survey have submitted to this Board all cases occurring in the light lists concerning which there is a difference in usage or opportunity for improvement. These questions have been discussed and decided, and the decisions go far toward settling the nomenclature of the coast and lake shores.

The Census Office has submitted to the Board all cases of difference of usage in county and township names, and the names of corporate towns, cities, etc., and all these questions, numbering fully 1,000, have been decided after suitable investigation. In connection with this work the Board has made certain minor, but widespread changes in nomenclature, which are expressed in principles 5 to 10, inclusive. (See page 8.) As a part of this work the Board has, after examination and the decision of all disputed cases, approved a certain form of spelling of the names of the counties of the United States.

ORIGIN OF AND CHANGES IN NAMES.

With the exception of the names of political subdivisions, geographic names in this country have not, as a rule, been bestowed by any formal authority. The names of natural features, rivers, lakes, mountains, capes, etc., and of unchartered bodies of population, have received their names originally from explorers, surveyors, and early settlers, and these names have been perpetuated by common consent. The names of states, counties, and municipalities of all classes, on the other hand, have been applied either by legislative enactment or charter, and therefore possess some degree of formal authority.

Differences of usage exist to a large extent, not only in the names of natural features and unincorporated places, but even in those of organized bodies of population whose names have been bestowed by formal authority. These differences have originated in numerous ways.

In the unsettled parts of the country, different exploring expeditions, ignoring the work of their predecessors, have given new names to features already named. As elsewhere noted, this difficulty has often occurred in Alaska, which has been visited in recent years by numerous expeditions.

The transliteration of Indian names has everywhere been a fruitful source of differences in spelling, inasmuch as no two persons understand alike or render into the same English characters the obscure sounds of Indian names.

It often happens in the case of the larger geographic features, such as extended mountain ranges, rivers, etc., that different names have been applied locally in different parts, and these different names have become well settled in usage.

It frequently happens that railroads adopt names for their stations different from those of the towns or villages in which they are situated, and thus divide the usage. To a much greater extent, however, than the railroads has the Post-Office Department confused the nomenclature of the smaller towns and villages by attaching names to the post-offices not in accordance with those in local usage. Indeed, a list shows that there are in this country thousands of cases where the name of the post-office does not conform to the local name of the place in which it is situated. These differences are very confusing to those using the postal service, and it seems desirable to reduce their number as far as practicable, at the same time recognizing the importance of having but one post-office of the same name in each state.

By far the greater number of differences in usage, however, have their origin in carelessness or ignorance on the part of those making use of the names. Such errors appearing in print are frequently perpetuated, especially in popular works, and often supplant the original name in usage.

Originating in these divergencies of spelling, there is distinctly traceable a development of geographic nomenclature, which is on the whole proceeding in a beneficial direction. Its tendency is towards the discarding of objectionable names and the adoption of pleasing ones, and towards the simplification and abbreviation of names, particularly as shown in the dropping of silent letters. The Board, recognizing this course of development, deems it to be within its power to guide it, and even to forestall it, as far as its future course may be foreseen.

The extent to which geographic names have been modified without being radically changed is scarcely appreciated. A large proportion, probably a majority of the names of natural features have undergone changes in spelling to a greater or less extent since they were first applied, while of the names of political divisions, although established by formal act, a considerable proportion have also changed, and such changes have, in thousands of cases, become firmly established. Therefore the position assumed by some persons, that we should revert to the original forms of names, would, if carried out, result in changing the names of a large proportion of our natural and artificial features.

POLICY OF THE BOARD.

The Board is agreed that in general the name which is in common local use at present should be adopted. This is a broad general principle, and summarizes the policy of the Board, with the exception of certain classes of cases mentioned below. It covers cases of changes or corruptions of names, except where such changes or corruptions are considered to be unworthy of perpetuation.

The difficulties encountered in carrying out this principle are found mainly in determining what is local usage, or the prevailing local usage where it is divided between different forms. Where the local usage is so divided, opportunity is afforded for the selection of the more appropriate and euphonious of the names in use.

The Board considers it desirable to depart from local usage in certain cases in order to effect reforms in nomenclature. Among these departures approved by the Board are the following:

(*a*) The avoidance, so far as seems practicable, of the possessive form of names.

(*b*) The dropping of the final "h" in the termination "burgh."

(*c*) The abbreviation of "borough" to "boro."

(*d*) The spelling of the word "center" as here given.

(*e*) The discontinuance of the use of hyphens in connecting parts of names.

(*f*) The omission wherever practicable of the letters "C. H." (Court House) after the names of county seats.

(*g*) The simplification of names consisting of more than one word by their combination into one word.

(*h*) The avoidance of the use of diacritic characters.

(*i*) The dropping of the words "city" and "town" as parts of names.

All of these changes are warranted by the direction of development. The possessive form of names is rapidly disappearing, except in rare cases where good reason exists for its retention. In most cases this is effected by dropping the apostrophe and the final "s." In certain cases, however, usage or euphony appears to require the retention of the final "s" when the apostrophe only is dropped.

Concerning the termination "burg" or "burgh," as Pittsburg, an extensive correspondence has developed the fact that in more than three-fourths of the places having this termination the final "h" is not in local use. The case of the termination "boro" or "borough," as Attleboro, is very similar. The present tendency is strongly toward the substitution of the abbreviated form. The Board therefore deems it desirable and advisable to induce uniformity in this matter in the manner indicated.

In the case of the word "center" as part of a name, as Mansfield Center, Center Rutland, usage appears to be about equally divided between *center* and *centre*, and the Board has adopted the first of the above forms of the word.

Hyphens, in connecting parts of names, appear to be useless, while they add to the complexity of the spelling.

The practice of adding the letters "C. H.," meaning court-house, to the name of a county seat is prevalent, especially in the southern states. Frequently the place has two names, one being its charter name, the other the name of the county with "C. H." appended; thus the county seat of Raleigh County, W. Va., is known as Beckley and as Raleigh "C. H."

The tendency toward simplification is in no way shown more decidedly

than in the combination of the several words forming a name. Thus "La Fayette" has become well nigh universally "Lafayette," "El Dorado" has become "Eldorado," etc. The Board approves this tendency and will further it as far as possible without forestalling usage too greatly.

The use of diacritic characters in geographic names, in the United States, such as the German umlaut, the Spanish tilde, etc., is rapidly disappearing. It would be impossible, even were it desirable, to oppose this change.

The practice of adding the word city or town, as Boise city, Marshalltown, as a part of the name is a useless complication, growing in most cases out of an optimistic spirit on the part of the promoters of the place. It is often misleading and almost invariably unnecessary.

Outside of the United States, where the Department of State and United States Hydrographic Office are chiefly interested, the work of the Board is directed to the harmonization of American usage in geographic nomenclature with the usage of the great map-making nations—England, Germany, and France. The Department of State, by reason of its diplomatic and consular functions, is intimately concerned with the present style, change of names, transfers of territorial jurisdiction, cession and acquisition of territory by various governments abroad, and the proper forms of the titular political nomenclature of foreign states and nations. The interest of the Hydrographic Office is involved by reason of its publication of charts and sailing directions of all foreign waters, to the effective use of which uniformity of geographic nomenclature is obviously indispensable. The forms of foreign names recommended for adoption are determined on consultation of established usage, the best authorities upon ethnological and political history and derivation, and current geographic and political information from authentic sources.

Many names in foreign civilized countries present a peculiar difficulty and appear to require that a further exception be made to the general principle of following local usage. This lies in the fact that many foreign names have been anglicized and the anglicized form, often quite different from the local form (meaning by local form that in use by the best authorities in the country having jurisdiction), is well established in usage in this country.

It is understood by the Board that our charts of the coasts of foreign countries using Roman characters, made for the use of our Navy and merchant marine, generally require the use of the local forms of these names; while, on the other hand, popular usage in this country, especially in our atlases and text books, requires the anglicized form. The Board practically leaves this matter on the same footing as heretofore, permitting the use of local forms of foreign names upon our charts, and the anglicized forms upon maps designed for use in this country. It hopes, however, that the way may be opened in the near future to the adoption throughout of the local forms of these names, and the rejection of the anglicized forms. In such specific cases as have been brought to its attention, it has decided uniformly in favor of the local form.

Most of the nations of Europe, either through national boards or geographic societies, are engaged in the regulation of the orthography of geographic names. Their attention has been particularly directed toward producing uniformity in the transliteration of aboriginal names written in characters other than Roman. These nations have practically agreed upon a system of transliteration, which, with one or two exceptions, has been adopted by this Board, thus coming into practical agreement in this matter with the rest of the civilized world.

The matters above discussed have been formulated as principles for the guidance of the Board in deciding specific cases. It must be understood that these are not designed as rules, but as guiding principles, from which the Board reserves liberty to depart whenever, in its judgment, it deems it advisable to do so.

PRINCIPLES FOR SPECIAL APPLICATION IN THE UNITED STATES.

1. That spelling and pronunciation which is sanctioned by local usage should in general be adopted.
2. Where names have been changed or corrupted, and such changes or corruptions have become established by local usage, it is not in general advisable to attempt to restore the original form.
3. In cases where what was evidently originally the same word appears with various spellings sanctioned by local usage, when applied to different features, these various spellings should be regarded as in effect different names, and as a rule it is inadvisable to attempt to produce uniformity.
4. Where a choice is offered between two or more names for the same place or locality, all sanctioned by local usage, that which is most appropriate and euphonious should be adopted.
5. The possessive form should be avoided whenever it can be done without destroying the euphony of the name, or changing its descriptive application.
6. In names ending in "burgh," the final "h" should be dropped.
7. Names ending in "borough" should be abbreviated to "boro."
8. The word "center," as a part of a name, should be spelled as above and not "centre."
9. The use of hyphens in connecting parts of names should be discontinued.
10. The letters "C. H." (Court House) appended to the names of county seats should be omitted.
11. In the case of names consisting of more than one word, it is desirable to combine them into one word.
12. It is desirable to avoid the use of diacritic characters.
13. It is desirable to avoid the use of the words city and town, as parts of names.

PRINCIPLES FOR SPECIAL APPLICATION IN FOREIGN COUNTRIES.

14. Geographic names in countries that use Roman characters should be rendered in the form adopted by the country having jurisdiction, except where there are English equivalents already fixed by usage. In cases where the English equivalent is so different from the local form that the identity of the latter with the former might not be recognized, both forms may be given.
15. The spelling of geographic names that require transliteration into Roman characters should represent the principal sounds of the word as pronounced in the native tongue, in accordance with the sounds of the letters in the following system:

An approximation only to the true sound is aimed at in this system. The vowels are to be pronounced as in Italian and on the continent of Europe generally, and the consonants as in English.

Letters.	Sounds.	Example.
a	ah, a as in father	Java, Banána, Somáli, Bari.
e	eh, e as in men	Tel el Kebír, Oléleh, Medina, Levuka, Peru.
i	English e; i as in ravine; the sound of ee in beet. Thus, not Feejee, but	Fiji, Hindi.
o	o as in mote.	
u	double o, as in boot.	
	All vowels are shortened in sound by doubling the following consonant	Yarra, Tanna, Jidda, Bonni.
	Doubling of a vowel is only necessary where there is a distinct repetition of the single sound	Nuulua.
ai	English i as in ice	Shanghai.
au	ow as in how. Thus, not Foochow, but	Fuchau.
ao	is slightly different from above	Nanao.
ei	is the sound of the two Italian vowels, but is frequently slurred over, when it is scarcely to be distinguished from ey in the English they	Beirút, Beilúl.
b	English b.	
c	is always soft and nearly the sound of s; the hard c is given by k.	Celebes.
ch	is always soft, as in church	Chingchin.
d	English d.	
f	English f; ph should not be used for the sound of f. Thus, not Haiphong, but	Haifong, Nafa.
g	is always hard (soft g is given by j)	Galápagos.
h	is always pronounced when inserted.	
j	English j. Dj should never be put for this sound	Japan, Jinchuen.
k	English k. It should always be put for the hard c. Thus, not Corea, but	Korea.
kh	the Oriental guttural	Khan.
gh	is another guttural, as in the Turkish	Dagh, Ghazi.
l, m, n	as in English.	
ng	has two slightly different sounds, as in finger, singer.	
p	as in English.	
q	should never be employed; qu is given by kw	Kwangtung.
r, s, t, v, w, x	as in English	Sáwákin.
y	is always a consonant, as in yard (Kikuyu), and therefore should not be used for the vowel i. Thus, not Mikindány, but	Mikindáni.
z	English z	Zulu.
	Accents should not generally be used, but where there is a very decided, emphatic syllable or stress which affects the sound of the word it should be marked by an acute accent	Tongatábu, Galápagos, Palá-wan, Saráwak.

In conclusion, the Board respectfully calls your attention to the fact that it has no means provided for printing and circulating its decisions. Thus far the bulletins of the Board have been published by various bureaus represented. Through the courtesy of the Smithsonian Insti-

tution, and at its expense, Bulletin No. 1 has been published, and an edition of 7,000 copies distributed. The Coast and Geodetic Survey has printed its second bulletin with an edition of 7,500 copies, and the Light-House Board has through the Treasury Department printed the third bulletin, with an edition of 8,000. This method of publication is obviously unsatisfactory. It is important that the decisions of the Board be promptly brought to the attention of the officers of the Government, and this can be done only by their prompt publication and wide circulation. Judging from past experience, it appears that 10,000 copies of each of its bulletins will be required to meet the demands of the Government Departments.

The general public, and especially the newspapers, the educators and the educational publishers of the country have manifested great interest in the work of the Board. Its decisions have been generally accepted by geographers, publishers, and educators, and it seems on all accounts desirable that these classes should be informed promptly and fully of the decisions. To supply them would require an equal number, and the Board asks that recommendation be made to Congress that proper provision be made for printing and distributing these bulletins.

There are submitted herewith, as Appendix A, a list of the decisions of the Board, and as Appendix B, a list of the counties of the United States, with the spelling as authorized by the Board.

Respectfully submitted.

T. C. MENDENHALL,
Chairman.

Appendix A.

LIST OF DECISIONS.

rwing lists the adopted forms are printed in heavy face lower case type, certain discarded ered in the same alphabetical list and printed in *italics*. In each case after the discarded pted form is added in parentheses for ready reference.

IN THE UNITED STATES.

set Point. Kennebec River,

t Point. (Abagadasset.)
llen County, Indiana.
boit.)
Range. Wyoming and Mon-

New Jersey. (Absecon.)
Atlantic County, New Jersey.
. (Acabonack.)
k Harbor. Long Island, New

County seat, Accomac Co.,
.
C. H. (Accomac.)
ock. Raritan River, New Jer-

McLeod County, Minnesota.
Acoma.) Minnesota.
ek and Landing. (Aquia.)
Warren County, Indiana.
reek. Ossabaw Sound, Geor-

land. (Agattu.)
land. Alaska.
and. Semidi Islands, Alaska.
Island. Off east side Alaska
la.
sland. (Aghiyuk.)
it. Columbia River, Washing-

ames River, Virginia.
iken.)
ding. (Aiken.)
d. (Akun.)
nd. (Akun.)

Akoun Island. (Akun.)
Akoutan Island. (Akutan.)
Akun Island. Alaska.
Akutan Island. Alaska.
Alamota. Lane County, Kansas.
Alapaha. Berrien County, Georgia.
Alaska Peninsula. Alaska.
Alexander. Tallapoosa County, Alabama.
Aliashka Peninsula. (Alaska.)
Aliaska Peninsula. (Alaska.)
Allapaha. (Alapaha.)
Allegany. Potter County, Pennsylvania.
Allegheny. (Allegany.) Pennsylvania.
Alloway Landing. Mississippi River, Mississippi.
Alomata. (Alamota.)
Alsek River. Alaska.
Altsek. (Alsek.)
Altsekh. (Alsek.)
Amatignak Island. Andreanof Islands, Alaska.
Amatignake Island. (Amatignak.)
Amatignakh Island. (Amatignak.)
Amchitka Island. Alaska.
Amdal. (Aurdal.)
Ames Ripple. Ohio River, West Virginia.
Amite. Tangipahoa Parish, Louisiana.
Amitkhitka Island. (Amchitka.)
Amoughta Island. (Amukta.)
Amoukhta Island. (Amukta.)
Amtchitka Island. (Amchitka.)
Amuchta Island. (Amukta.)
Amukta Island. Alaska.

Anacostia River. District of Columbia.
Andreafski, Fort. On Yukon River, Alaska.
Andreanof Islands. Alaska.
Andreanov Islands. (Andreanof.)
Andreanowsky Islands. (Andreanof.)
Andreaivsky Fort. (Andreafski.)
Andreiefski Fort. (Andreafski.)
Andreievsky Fort. (Andreafski.)
Angers. (Angus.)
Angus. Polk County, Minnesota.
Aniakcha Bay. (Aniakchak.)
Aniakchak Bay. East side Alaska Peninsula.
Ankeny Landing. Columbia River, Oregon.
Apalachee Bay. Florida.
Apalachicola. River, bay, and town, Florida.
Appalachee Bay. (Apalachee.)
Appalachicola. (Apalachicola.)
Applecreek. Wayne County, Ohio.
Appledore Island. One of the Isles of Shoals, Me. The change from Hog Island to Appledore Island has been effected for a number of years, and the name adopted is that found universally in the official documents of the town of Kittery.
Aquia. Creek and Landing, Potomac River, Virginia.
Arago, Cape. Oregon.
Arapahoe. Haskell County, Kansas.
Archbald. (Archbold.)
Archbold. Fulton County, Ohio.
Archer. O'Brien County, Iowa.
Archer Grove. (Archer.)
Arizona. Claiborne Parish, Louisiana.
Arizonia. (Arizona.) Louisiana.
Arkansas Post. Arkansas County, Arkansas.
Armstrong. Mississippi River, Illinois.
Arnold. Mississippi River, Illinois.
Arrapahoe. (Arapahoe.) Kansas.
Ashbee Harbor. Roanoke Island, North Carolina.
Ashby's Cove. (Ashbee.)
Ashport. Lauderdale County, Tennessee.
Atherton. Mississippi River, Illinois.
Atka Island. Alaska.
Atkha Island. (Atka.)
Atkisson Dam. Kanawha River, West Virginia.
Attoo Island. (Attu.)
Attou Island. (Attu.)
Attu Island. Alaska.
Aubrey. (Aubry.)
Aubry. Johnson County, Kansas.
Aucilla. River and post-office, Florida.
Augustin Island. (Augustine.)
Augustine Island. In Cook Inlet, Alaska.
Aurdal. Ottertail County, Minnesota.
Averill Dock. St. Lawrence River, New York.
Avery Ledge. Off Cape Ann, Massachusetts.
Avery Rock. Machias Bay, Maine.
Ayletts. King William County, Virginia.
Ayres Island. Mesquite Bay, Texas.
Babbs Island. Ohio River, West Virginia.
Bacon Inlet. Long Bay, North Carolina.
Baggers Point. Indian River, Florida.
Bailey Harbor. Lake Michigan, Wisconsin.
Bailey Light. Massachusetts.
Baker Island. Frenchman Bay, Maine.
Baker Island. Ohio River, Ohio.
Baker Shoal. Delaware River, New Jersey.
Bald Head. Cape Fear River, North Carolina.
Bald Rock. Frenchman Bay, Maine.
Ball Head. (Bald Head.)
Ballston Spa. Saratoga County, New York.
Bango. (Bango.) Indiana.
Bang's Island. (Cushing.)
Banister River. Branch of Dan River, Virginia.
Bannister River. (Banister.)
Baranof Island. Alaska.
Barber Point. Lake Champlain, New York.
Barbre Landing. Red River, Louisiana.
Barkley. Jasper County, Indiana.
Barnes Landing. Mississippi River, Mississippi.
Barnwell Place. Savannah River, South Carolina.
Baronoff Island. (Baranof.)
Barre. (Barree.)
Barree. Huntingdon County, Pennsylvania.
Barslow Rock. (Barstow.)

. Coast of Massachusetts.
ettlement. Louisiana.
ment. (Barthelemy.)
Long Island Sound, Con-
ig. Ohio River, Illinois.
tesville.)
el. St. Clair River, Mich-
ri River, Missouri.
ipley County, Indiana.
ssippi River, Missouri.
rt County, Indiana.
an County, New Jersey.
(Yakutat Bay.)
nando County, Florida.
(Point Comfort.)
ird. (Bayou Grand Liard.)
Liard. Louisiana.
rd. (Bayou Petit Liard.)
iard. Louisiana.
Breach Inlet.)
(Beresford.)
ampa.)
hall County, Kansas.
(Buckley Bluff.)
e. Alaska Peninsula.
eigh County, West Vir-
Bering.)
. Mississippi River, Ar-
Whitehall Narrows, Ver-
Logan County, Ohio.
Bellecenter.)
Belle Plaine.)
Norton County, Kansas.
Fayette County, Pennsyl-
rrison County, Minnesota.
IcLean County, Illinois.
Currituck Sound, North
lmore.) Ohio.
lississippi River, Missouri.
York River, Virginia.
County, Georgia.
nam County, Ohio.
on.)
lount. North of Golovin
rton Sound, Alaska.
icia.)
no County, California.
ce. Whitehall Narrows,
lain, Vermont.

Benkelman. Dundy County, Nebraska.
Benkleman. (Benkelman.)
Bennet. (Bennett.)
Bennett. Lancaster County, Nebraska.
Benoni Point. Choptank River, Maryland.
Bentleyville. (Bentleysville.)
Bentleysville. Washington County, Pennsylvania.
Berdeleben Mount. (Bendeleben.)
Beresford Lake. Florida.
Bering Haven. (Controller Bay.)
Bering Sea. Alaska.
Berkley. (Barkley.)
Bern. Adams County, Indiana.
Bern. Berks County, Pennsylvania.
Berne. (Bern.)
Berneville. (Bernville.)
Bernville. Berks County, Pennsylvania.
Besboro Island. In Norton Sound, Alaska.
Besborough Island. (Besboro.)
Bethal. (Bethel.)
Bethel. Fulton County, Pennsylvania.
Bethel. Berks County, Pennsylvania.
Bethlehem Reach. Ohio River, Kentucky.
Betts Chute. Mississippi River, Minnesota.
Bieller. Mississippi River, Louisiana.
Big Annemessex River. Maryland.
Big Annemessic River. (Big Annemessex.)
Big Diomede Island. Bering Strait, Alaska.
Bigler Mill. York River, Virginia.
Biglick. Hancock County, Ohio.
Bill Williams River. (Williams.)
Birch Cooley. Renville County, Minnesota.
Birch Coolie. (Birch Cooley.)
Birchdale. Todd County, Minnesota.
Birdseye. Dubois County, Indiana.
Birds Point. Mississippi River, Missouri.
Bishop. Mississippi River, Missouri.
Bishop and Clerks Light. Massachusetts.
Bishop Head. Hooper Strait, Chesapeake Bay, Maryland.
Bismarck. Sibley County, Minnesota.
Bismarck. Platte County, Nebraska.
Bismarck. Cuming County, Nebraska.
Bismark. (Bismarck.)
Blackcreek. Mercer County, Ohio.
Blackistone Island. (Blakistone.)
Blacklick. Indiana County, Pennsylvania.

Blacks Island. Ohio River, West Virginia.
Blackstock. Chester County, South Carolina.
Blackwells Island. East River, New York.
Blain. Perry County, Pennsylvania.
Blaine. (Blain.) Pennsylvania.
Blakeley. (Blakely.)
Blakely. Geary County, Kansas.
Blakely. Scott County, Minnesota.
Blakistone Island. Potomac River, Maryland.
Named for Dr. Blakistone, now living on the island.
Blanco, Cape. Oregon.
The decision is in accordance with local usage, and the name applies singularly well to the cape in question.
Blennerhassett Island. Ohio River, Ohio.
Block. Mississippi River, Missouri.
Bloodsworth Island. Chesapeake Bay, Maryland.
Bloomfield. (South Bloomfield.) Ohio.
Bloomfield. Greene County, Indiana.
Blooming Grove. Richland County, Ohio.
Bloomington. (Bloomfield.)
Blount Creek. Blount Bay, North Carolina.
Bluehill. Sherburne County, Minnesota.
Blue Point Towhead. Mississippi River, Arkansas.
Bluffdale. Greene County, Illinois.
Blunt's Island. (Smith Island.)
Blunts Reef. Off Cape Mendocino, California.
Bochonoff Lake. (Becharof.)
Bodie Island. Coast of North Carolina.
Body's Island. (Bodie.)
Boggs Island. Ohio River, West Virginia.
Bogoslof Island. West of Unalaska, Alaska.
Bogoslov Island. (Bogoslof.)
Bogy. Mississippi River, Missouri.
Boise. Ada County, Idaho.
Bokescreek. Logan County, Ohio.
Bonaventure. Wilmington River, Georgia.
Bondin. Murray County, Minnesota.
Bonesecours Bay. (Bon Secours.)
Bonsecours Bay. (Bon Secours.)
Boneta Point. (Bonita.)
Bone Venture. (Bonaventure.)
Bonita Point. San Francisco Entrance, California.
Bon Secours Bay. Alabama.
Boon. Wexford County, Michigan.
Boone. (Boon.)
Boothbay. Town and harbor, Maine.
Booth Point. Mississippi River, Tennessee.
Borden Flats. Mount Hope Bay, Massachusetts.
Botcharoff Lake. (Becharof.)
Bougere. Mississippi River, Louisiana
Boulder Island. (Karpa Island.)
Bouldir Island. (Buldir.)
Bouldyr Island. (Buldir.)
Bourbois. Gasconade County, Missouri.
Bourbonnais. Kankakee County, Illinois.
Bourbonnais Grove. (Bourbonnais.)
Bowdin. (Bondin.)
Bowen. Hancock County, Illinois.
Bowensburg. (Bowen.)
Bowie Point. Mississippi River, Louisiana.
Bowlers Ledge and Rock. Rappahannock River, Virginia.
Boyer Bluff. Green Bay, Wisconsin.
Boykins. Southampton County, Virginia.
Boykin's Depot. (Boykins.)
Boyne. Charlevoix County, Michigan.
Braddock Point. Lake Ontario, New York.
Bradford Landing. Kanawha River, West Virginia.
Bradley. Mississippi River, Arkansas.
Bradley Reserve. Indian River, Florida.
Braggadocia. (Braggadocio.)
Braggadocio. Pemiscot County, Missouri.
Brandy. (Brandy Station.)
Brandy Station. Culpeper County, Virginia.
Brashear. Adair County, Missouri.
Brasheare. (Brashear.)
Breach Inlet. South Carolina.
Breaux. (Breaux Bridge.)
Breaux Bridge. St. Martin Parish, Louisiana.
Breckenridge. Caldwell County, Missouri.
Breckinridge. (Breckenridge.)
Brenton Reef. Entrance to Narragansett Bay, Rhode Island.
Breton. Sound and Island, Louisiana.

reek. Coosaw River, South

and. (Sears Island.)
ing. Illinois River, Illinois.
ississippi River, Louisiana.
n. (Bristoe.)
ince William County, Vir-

Huntingdon County, Penn-

Reach. Connecticut River,
t.
afford County, Virginia.
. Suffolk County, New York.
ookside.)
Ohio River, Kentucky.
Madison County, Illinois.
nt. Mississippi River, Illi-

Bracken County, Ken-

alley. Somerset County,
nia.
k. Plymouth Harbor, Mas-

ek. St. Johns River, Flor-

ek. Jewell County, Kansas.
ad. Fox Island Thorofare,

nd. Ohio River, West Vir-

nt. Ohio River, Illinois.
nd. Ohio River, Pennsyl-

lluff. St. Johns River, Flor-

Stephenson County, Illinois.
Morgan County, Georgia.
Brown County, Illinois.
iver. Kotzebue Sound,

ff. St. Johns River, Florida.
Mississippi River, Arkansas.
Puget Sound, Washington.
. Columbia River, Oregon.
d. Near Islands, Alaska.
Albemarle Sound, North Car-

. Calibogne Sound, South

u. Mississippi River, Louis-

int. Providence River,
nd.
ourbois.)

Bureau. Bureau County, Illinois.
Bureau Junction. (Bureau.)
Burnesville. (Burnsville.)
Burnetts Creek. (Burnettsville.)
Burnettsville. White County, Indiana.
Burnham Island. Mississippi River, Illinois.
Burnhamsville. Todd County, Minnesota.
Burnside River. Skidaway Island, Georgia.
Burnsville. Dakota County, Minnesota.
Burnt Coat Island. (Swan Island.)
Burnt Mountain. (Redoubt Volcano.)
Burrows Bay. Rosario Strait, Washington.
Burside River. (Burnside.)
Bush Bluff. Elizabeth River, Virginia.
Byram Harbor. (Port Chester Harbor.)
Cables Eddy. Ohio River, Ohio.
Cache Creek (Cache la Poudre.)
Cache la Poudre Creek. Colorado.
Caesar Creek. Dearborn County, Indiana.
Cahaba. Dallas County, Alabama.
Cahawba. (Cahaba.)
Calver Plaat Island. Hudson River, New York.
Calvert. Marshall County, Kentucky.
Calves Islands. Connecticut River, Connecticut.
Calvey. Franklin County, Missouri.
Calvy. (Calvey.)
Campbell Island. Cape Fear River, North Carolina.
Campbell Landing. Illinois River, Illinois.
Campbellsville. Giles County, Tennessee.
Campbellville. (Campbellsville.)
Campobella. (Campobello.)
Campobello. Spartanburg County, South Carolina.
Canal Dover. (Dover.)
Canal Winchester. Franklin County, Ohio.
Canaville. (Caneyville.)
Caneyville. Chautauqua County, Kansas.
Cannelville. Muskingum County, Ohio.
Cañon City. (Canyon.)
Cantril. Van Buren County, Iowa.
Cantrill. (Cantril.)
Canyon. Fremont County, Colorado.
Capahosic. Gloucester County, Virginia.

Cape Ann Harbor. (Gloucester.)
Cape Cod Highland Light. (Cape Cod Light.)
Cape Cod Light. Massachusetts.
Cape Dall. (Dall Point.)
Capel. Sioux County, Iowa.
Cape Manby. (Manby Point.)
Cape Neddick Light. York, Maine.
Cape Neddick Nubble Light. (Cape Neddick Light.)
Cappahosack. (Capahosic.)
Carankaway. (Karankawa.)
Caratunk. (Carritunk.)
Carey Camp. Lake Champlain, New York.
Caronkaway. (Karankawa.)
Carpenter Bar. Ohio River, West Virginia.
Carpentersville. Putnam County, Indiana.
Carpenterville. (Carpentersville.)
Carquines Strait. (Karquines.)
Carquinez Strait. (Karquines.)
Carr. (Cass.)
Carritunk. Somerset County, Maine.
Carr Landing. Mississippi River, Arkansas.
Carroll Island. Mississippi River, Illinois.
Carrollton. (Carrolton.)
Carrolton. Cattaraugus County, New York.
Carrs Run. Ohio River, Ohio.
Carter Landing. Above Cloverport, Ohio River, Kentucky.
Carvers Harbor. Fox Islands, Maine.
Cass. Clark County, Indiana.
Cashai River. (Cashie.)
Cashie River. Branch of Roanoke River, North Carolina.
Castile. Wyoming County, New York.
Castle. (Castile.)
Catharine. Ellis County, Kansas.
Catharine. Schuyler County, New York.
Catharine. Blair County, Pennsylvania.
Catherine. (Catharine.)
Caulk Point. Mississippi River, Arkansas.
Causten's Bluff. (Causton.)
Causton Bluff. Wilmington River, Georgia.
Cedar Creek. (Caesar Creek.)
Cedar Keys. Levy County, Florida.
Cedar Point. (Upper Cedar Point.)
Cedartown. Polk County, Georgia.
Cedarvale. Chautauqua County, Kansas.
Center Island. Oyster Bay, Long Island Sound.
Centerport. Berks County, Pennsylvania.
Centerview. Johnson County, Missouri.
Centre Port. (Centerport.)
Centreview. (Centerview.)
Cerrogordo. Lac qui Parle County, Minnesota.
Chaffin Bluff. James River, Virginia.
Chafin's Bluff. (Chaffin.)
Chagwamegan. (Chequamegon.)
Chandler Bay. West of Roque Island, coast of Maine.
Chandler Landing. Red River, Louisiana.
Chankliut Island. West of Semidi Islands, Alaska.
Chankluit Island. (Chankliut.)
Chapin's Bluff. (Chaffin.)
Chapman Dock. Whitehall Narrows, Lake Champlain, New York.
Chapman Shoal. St. Lawrence River, New York.
Chapowamsie Creek. (Chopawamsic.)
Charleston. (Charlestown.) Minnesota.
Charleston. Tioga County, Pennsylvania.
Charlestown. Redwood County, Minnesota.
Charlestown. (Charleston.) Pennsylvania.
Cheek Landing. Mississippi River, Arkansas.
Chefonte River. (Chefuncte.)
Chefuncte River. Louisiana.
Chegoula Island. (Chugul.)
Chegwamigo. (Chequamegon.)
Chengwatana. Pine County, Minnesota.
Chengwatona. (Chengwatana.)
Chequamegan. (Chequamegon.)
Chequamegon. Point and bay, Lake Superior.
Chernabour Island. (Chernabura.)
Chernaboura Island. (Augustine.)
Chernabura Island. North of Sannak Island and east of Unimak, Alaska.
Chernobour Island. (Chernabura.)
Chernobura Island. (Chernabura.)
Cherryhill. Indiana County, Pennsylvania.

tree. Indiana County, Pennsyl-
.
tree. Venango County, Pennsyl-
.
eake. Cecil County, Maryland.
uthill. Monroe County, Pennsyl-
.
Islands. (Chiachi.)
i Islands. South coast Alaska
ısula.
Islands. (Chiachi.)
gof Harbor. Attu Island, Alaska.
ıxen Creek. (Chicomuxen.)
ıxen Creek. (Chicomuxen.)
ıuxen Creek. Potomac River,
land.
tee River. (Chefuncte.)
Island. Near Great Sitkin Island,
:a.
River and Pass. (Chilkat.)
t River and Pass. Alaska.
ot Village and Pass. Alaska.
Village and Pass. (Chilkoot.)
ı Bend. Whitehall Narrows,
Champlain, New York.
k Bay. Northeast side Kadiak
d, Alaska.
skov Bay. (Chiniak.)
ıapin. Duplin County, North
ina.
pin. (Chinquapin.)
f Island. (Chirikof.)
of Island. Near Semidi Islands,
:a.
k Cape. South side of St. Law-
Island, Alaska.
Point. Choptank River, Mary-

wamsic Creek. Potomac River,
nia.
amsic Creek. (Chopawamsic.)
gin Islands. (Shumagin.)
et Island. (Chowiet.)
Et. Island. (Chowiet.)
Island. (Chowiet.)
et Island. Semidi Islands,
:a.
ck. (Chuckatuck.)
atuck. Nansemond County, Vir-
.
i. (Prince William Sound.)
tik Bay. (Kachemak.)
tik Bay. (Kachemak.)
Island. (Shuyak.)
h. (Prince William Sound.)
ıadak Island. Alaska.

Chugnel Island. (Chugul.)
Chugul Island. North of Amukta Island, Alaska.
Chulitna River. Alaska.
Church Island. Currituck Sound, North Carolina.
Churdan. Greene County, Iowa.
Chuyak Island. (Shuyak.)
Claiborne Island. Mississippi River, Louisiana.
Clarke. Coshocton County, Ohio.
Clarke Point. Lake Michigan, Illinois.
Clarkesville. (Clarksville.)
Clark Point. Buzzards Bay, Massachusetts.
Clark. (Clarksville.)
Clarks, Ohio. (Clarke.)
Clarks Hill. Tippecanoe County, Indiana.
Clarksville. Mercer County, Pennsylvania.
Claybanks. Oceana County, Michigan.
Clear Cape. (Cleare.)
Cleare, Cape. Southern extremity Montagu Island, Alaska.
Clearport. Fairfield County, Ohio.
Clearspring. Lagrange County, Indiana.
Clearwater. Wright County, Minnesota.
Clifton Heights. Delaware County, Pennsylvania.
Clitheral. (Clitherall.)
Clitherall. Ottertail County, Minnesota.
Cloquet. Carlton County, Minnesota.
Cloud Peak. (Cuyamaca.)
Coanjock Bay. North Carolina.
Cobourg. (Coburg.)
Coburg. Montgomery County, Iowa.
Cockle Creek. (Cockrell.)
Cock Pit Point. (Cockpit).
Cockpit Point. Virginia.
Cockrell Creek. Great Wicomico River, Virginia.
Coeyman Bar. Hudson River, New York.
Coffee Landing. Hardin County, Tennessee.
Coglua River. (Meade.)
Coinjack Bay. (Coanjock.)
Cole Branch. Ohio River, Kentucky.
Cole Ferry Shoal. St. Lawrence River, New York.
Colerain. Bertie County, North Carolina.

Coleraine. (Colerain.)
Coleridge. Cedar County, Nebraska.
Cold Bay. Alaska.
Coldwater River. Yazoo Bottom, Mississippi.
Colorado Chiquito. (Little Colorado.)
Colorado Range. (Front.)
Colorado River. The great river of the plateau region flowing into the Gulf of California.
Colquet. (Cloquet.)
Colton. (Cotton.)
Colt Pier. Below Hartford, Connecticut River, Connecticut.
Colvile River. (Colville.)
Colville Cape. (Watmough Head.)
Colville River. Alaska.
Commodore Point Shoal. St. Johns River, Florida.
Como. Panola County, Mississippi.
Comptroller Bay. (Controller.)
Conewago. Adams County, Pennsylvania.
Con Hook. Hudson River, New York.
Conneivville. (Cannelville.)
Conner Creek Flat. Detroit River, Michigan.
Conowago. (Conewago.)
Constantin Bay. (Constantine.)
Constantine Bay. Amchitka Island, Alaska.
Controller Bay. North of Kayak Island, Alaska.
Conway. Taylor County, Iowa.
Cook. (Cooke.)
Cooke. Cumberland County, Pennsylvania.
Cook Inlet. South side of Alaska.
Cook River. (Cook Inlet.)
Cooleridge. (Coleridge.)
Cooper Bar. Ohio River, Indiana.
Coos Bay. Oregon.
Coose Bay. (Coos.)
Cooter. (Coutre.)
Copasaw River. (Coldwater.)
Copel. (Capel.)
Copely. (Copley.)
Copely Center. (Copley.)
Copley. Summit County, Ohio.
Coraopiles. (Coraopolis.)
Coraopolis. Allegheny County, Pennsylvania.
Corapolis. (Coraopolis.)
Cordell. Mississippi River, Mississippi.
Corinion Bay. (Currioman.)
Corioman Creek. (Currioman Bay.)
Corpus Christi Inlet. (Corpus Christi Pass.)
Corpus Christi Pass. Between Padre and Mustang Islands, Texas.
Cortland. Dekalb County, Illinois.
Cortland. Republic County, Kansas.
Cotamy Bay. (Katama.)
Cote sans Dessein. Callaway County, Missouri.
Cotterals Key. (Cottrell.)
Cotton. Switzerland County, Indiana.
Cottrell Key. Florida.
Coulterville. (Coulterville.)
Coulterville. Randolph County, Illinois.
Courtland. (Cortland.)
Coutre. Pemiscot County, Missouri.
Cowyard. Plymouth, Massachusetts.
Cox Ripple. Ohio River, Ohio.
Crabtree Ledge. Sullivan Harbor, Maine.
Crader Field. Illinois River, Illinois.
Craig Bar. Ohio River, Indiana.
Cranberry. (Cranbury.)
Cranbury. Middlesex County, New Jersey.
Crawford Landing. Mississippi River, Missouri.
Crawford Landing. Ohio River, Ohio.
Crawfordville. Taliaferro County, Georgia.
Crescent Lake. Florida.
Cressap Bend. Ohio River, Ohio.
Cresswell. (Creswell.)
Creswell. Washington County, North Carolina.
Croatan Sound. North Carolina.
Croetan Sound. (Croatan.)
Crook Landing. Mississippi River, Illinois.
Cross Rip. (Cross Rip Shoal.)
Cross Rip Shoal. Nantucket Sound, Massachusetts.
Crow Dock. Raritan River, New Jersey.
Cubit's Crevasse. (Cubits Gap.)
Cubits Gap. Mississippi River, Louisiana.
Cubitt's Crevasse. (Cubits Gap.)
Cuerno Verde. (Wet Mountains.)
Cuiamacca. (Cuyamaca.)
Cuming. Dodge County, Nebraska.
Cumming. (Cuming.)
Cundiz. (Cundy.)
Cundy. Harbor, Ledges, and Point. Casco Bay, Maine.
Curles Neck. James River, Virginia.

ı **Bay.** Virginia.
sland. Portland Harbor,

ınnel. Patapsco River, Mary-

ı. **A mountain peak east of** o, California.
(Cuyamaca.)
ke. Hudson River, New York.
Humboldt County, Iowa.
(Dakota.)
t. South of Cape Romanzof,

'ook County, Illinois.
nt. St. Johns River, Florida.
ı **Marsh.** Great Wicomico irginia.
lat. St. Johns River, Florida.
)int. St. Johns River, Florida.
)int. Mississippi River, Ten-

Island. South Carolina.
(Dougherty.)
sland. (Dauphin.)
Island. Mississippi Sound, a.
Landing. Ohio River, Ohio.
Davis.)
)untain County, Indiana.
ding. Mississippi River, Mis-

lge. Boston Harbor, Massa-

Island. (Daufuskie.)
Bend. Mississippi River, Mis-

Island. Ohio River, Pennsyl-

Point. Maine.
nd. Mississippi River, Ar-

Missouri River, Missouri.
r **Bluff.** Green Bay, Wiscon-

Barber County, Kansas.
Orange County, New York.
L. Kittson County, Minne-

(Degonia.)
Jackson County, Illinois.
Humboldt County, Iowa.
Delana.)
Faribault County, Minnesota.
Watergap. Monroe County, 'ania.
(Deleon Springs.)

Deleon Springs. Volusia County, Florida.
Delevan. (Delavan.)
Demonts Island. (Dochet.)
Densford. Mississippi River, Tennessee.
Depere. Brown County, Wisconsin.
Derby Wharf. Salem Harbor, Massachusetts.
Devall Bluff. Prairie County, Arkansas.
Devils Elbow. Illinois River, Illinois.
Devils Elbow. St. Johns River, Florida.
Devils Island. Lake Superior, Wisconsin.
Devils Island. Mississippi River, Iowa.
Devils Nose. Lake Ontario, New York.
Devils Point. Escambia Bay, Florida.
Devils Pulpit. Whitehall Narrows, New York.
Devils Wharf. Above Essex, Connecticut River, Connecticut.
Dewitt. Carroll County, Missouri.
Dewitt Bar. Ohio River, Ohio.
Dice Head. Castine Harbor, Maine.
Dickson. Lackawanna County, Pennsylvania.
Dillard Wharf. James River, Virginia.
Disappointment, Cape. Washington.

"On the 6th of July, 1778, Meares, in the ship *Nootka*, arrived off the cape and found that a 'prodigious easterly swell rolled on the shore,' and he had soundings in 16 fathoms over a hard, sandy bottom. 'After we had rounded the promontory, a large bay, as we had imagined, opened to our view, that bore a very promising appearance and into which we steered, with every encouraging expectation. As we steered into the bay the water shoaled to 9, 8, and 7 fathoms, where breakers were seen right ahead, and from the masthead they were observed to extend across the bay. We therefore hauled out.' The name Cape Disappointment was given to the promontory. It was called Cape Hancock by Gray, in 1792. He changed this name to Cape Disappointment upon hearing that Meares had so named it. Cape Disappointment retained by Vancouver, by Belcher in 1839, and by Ex. Ex. in 1841. Duflot de Mofras, 1844, calls it Cape San Roque or Disappointment. It was

Disappointment, Cape.—Continued.
called Cape Hancock or Disappointment at the first examination of the entrance to the river, in 1850, and the name Hancock, subsequently, in a secondary manner in the Light-House List, but the name Disappointment is that used on the official charts and by all navigators." Pacific Coast Pilot, 1889, p. 456.

Dishroon. Mississippi River. Louisiana.
Dividend Creek. (Dividing.)
Dividing Creek. Below the Great Wicomico River, Virginia.
Dividing Creek. Choptank River, Maryland.
Dix Point. Straits of Ste. Marie, Michigan.
Dobelbower Landing. Columbia River, Oregon.
Dochet Island. St. Croix River, Maine.
Dockum. Dickens County, Texas.
Dodds Point. Mississippi River, Illinois.
Doffiemyer Point. Puget Sound, Washington.
Dollard's Wharf. (Dillard.)
Dollers Point. James River, Virginia.
Doltons Station. (Dalton.)
Donalds. Abbeville County, South Carolina.
Donaldsville. (Donalds.)
Donoho Battery. (Fishing Battery.)
Dorrance. Luzerne County, Pennsylvania.
Dorranceton. (Dorrance.)
Dorrancetown. (Dorrance.)
Dorrity. Mississippi River, Missouri.
Dougherty. Cerro Gordo County, Iowa.
Douglas. Stafford County, Kansas.
Douglass. (Douglas.)
Dover. Tuscarawas County, Ohio.
Dovre. Kandiyohi County, Minnesota.
Dowe. (Dovre.)
Drakeville. (Drakesville.)
Drakesville. Davis County, Iowa.
Drew Chute. Mississippi River, Iowa.
Drewry Bluff. James River, Virginia.
Drisco Shoal. Green Bay, Wisconsin.
Dr. Merry Light. Mississippi River, Iowa.
Drovers Point. (Baggers.)
Drummond Creek. St. Johns River, Florida.
Drummond Island. Lake Huron, Michigan.
Drummondtown. (Accomac.)
Drury Island. Mississippi River, Iowa.
Drury's Bluff. (Drewry.)
Dryden. Mississippi River, Missouri.
Dry Romer. (Romer Shoal.)
Duboistown. Lycoming County, Pennsylvania.
Duck Island. (Duck Islands.)
Duck Islands. Quoddy Roads, Maine.
Duff Bar. Ohio River, Pennsylvania.
Duller's Point. (Dollers.)
Dumpling Rock Light. Massachusetts.
Duncan Point. Mississippi River, Louisiana.
Dunn Creek. St. Johns River, Florida.
Dunn's Lake. (Crescent.)
Duplain. Clinton County, Michigan.
Duquoin. Perry County, Illinois.
Durfee. Mississippi River, Illinois.
Duvall's Bluff. (Devall.)
Dyerville. (Dyersville.)
Dyersville. Dubuque County, Iowa.
Eagan. (Egan.)
Eagle Grove. Wright County, Iowa.
Eagle Grove Junction. (Eagle Grove.)
East Boothbay. Village in town of Boothbay, Maine.
Eastern Branch. (Anacostia River.)
East Fork of Yellowstone River. (Lamar River.)
East Gouda Springs. (Gouda Springs.)
Easton Point. (Eaton.)
Eaton Point. Camden Harbor, coast of Maine.
Eatons Neck. Long Island Sound, New York.
Eau Plaine. (Eau Pleine.)
Eau Pleine. Portage County, Wisconsin.
Ebenecook. Coast of Maine.
Ebenicook. (Ebenecook.)
Eden. (Edon.)
Edgmont. Delaware County, Pennsylvania.
Edgemont. (Edgmont.)
Edina. Hennepin County, Minnesota.
Edina Mills. (Edina.)
Edon. Williams County, Ohio.
Edwards. Ogemaw County, Michigan.
Edwards Point. Galveston Bay, Texas.
Egan. Dakota County, Minnesota.
Elco. (Elko.)
Elderon. (Eldron.)

Eldron. Marathon County, Wisconsin.
Elizabethtown. Bartholomew County, Indiana.
Elkhorn Grove. Carroll County, Illinois.
Elkins Landing. Mississippi River, Missouri.
Elko. Barnwell County, South Carolina.
Elklick. Somerset County, Pennsylvania.
Ellicottsville. (Ellicottville.)
Ellicottville Cattaraugus County, New York.
Elliott Knob. Augusta County, Virginia.

This mountain has been locally known for many years as Elliott's Knob. The desire has been expressed to substitute the name of Rogers, in honor of Prof. W. B. Rogers, formerly the State geologist of Virginia, and a pioneer in the study of the geology of that State. This decision is based on the grounds, first, that the name Elliott Knob is well established; and, second, that a mountain peak in Virginia near the North Carolina line has already been named in honor of Prof. Rogers.

Elliott Landing. Columbia River, Washington.
Ellis Cliff. Mississippi River, Mississippi.
Ellis Island. New York Harbor, New York.
Ellisville. Jones County, Mississippi.
Elmwood. Saline County, Missouri.
Elmwood Place. Hamilton County, Ohio.
Emmet. St. Clair County, Michigan.
Emmet. Holt County, Nebraska.
Emmett. (Emmet.)
Englishman Bay. East and north of Roque Island, coast of Maine.
Ensly. Mississippi River, Tennessee.
Ephrata. Lancaster County, Pennsylvania.
Ephratah. (Ephrata.)
Eppes Island and Creek. James River, Virginia.
Erdahl. Grant County, Minnesota.
Erdal. (Erdahl.)
Errol Island. Southerly continuation of the Chandeleur Islands, Louisiana.
Ervin. Howard County, Indiana.
Erwin. (Ervin.)
Escholtz Basin. (Eschscholtz Bay.)
Eschscholtz Bay. In Kotzebue Sound, Alaska.
Esbon. (Ezbon.)
Etna. Siskiyou County, California.
Etna Mills. (Etna.)
Etolin Island. South of Kupreanof Island, Alaska.
Etoline Island. (Etolin.)
Evans Landing. Ohio River, Indiana.
Ezbon. Jewell County, Kansas.
Fairbank. Sullivan County, Indiana.
Fairchilds Island. Mississippi River, Mississippi.
Fairgrove. Tuscola County, Michigan.
Fairplay. Park County, Colorado.
Fairport. Lake County, Ohio.
Fairport Harbor. (Fairport.)
Fairweather Island. (Fayerweather.)
Falcon, Cape. Oregon.
Falkner Island. Long Island Sound.

Discovered by the Dutch captain, Adrien Block, in 1614, and named by him "Valcken Eylandt" (Falcon Island). This Dutch name was corrupted by the English to Fawkner's Island, Falkner's Island, and Falkland's Island. (Doctor Kohl's MS.)

Fallbrook. Tioga County, Pennsylvania.
Falls. Mississippi River, Arkansas.
False Tillamook Head. (Falcon, Cape.)
Faraby Island. North Landing River, Virginia.
Faulkner's Island. (Falkner Island.)
Fayerweather Island. Black Rock Harbor, Long Island Sound.
Fenwick Island. South of Cape Henlopen, Delaware.
Fenwick Island. South Carolina.
Fernbank. Hamilton County, Ohio.
Fiddler Ledge. Fox Island Thorofare, Maine.
Findley. Allegheny County, Pennsylvania.
Finley. Mississippi River, Iowa.
Finley. (Findley.) Pennsylvania.
Finns Point. Delaware River, New Jersey.
Fisher. Illinois River, Illinois.
Fisher. Polk County, Minnesota.
Fisher Landing. (Fisher.)
Fisherman Island Passage. Penobscot Bay, Maine.

Fisherman Point. Indian River, Florida.

Fisherman Reef. Lake Michigan, Wisconsin.

Fishers Island. Long Island Sound, New York.

Fishers Point. Opposite Philadelphia, Delaware River, New Jersey.

Fishes Ledge. (Fish Point.)

Fishing Battery. Entrance to Susquehanna River.

Fish Dock. St. Clair River, Michigan.

Fishpoint Ledge. (Fish Point.)

Fish Point Ledge. Coast of Maine.

Fitler. Mississippi River, Mississippi.

Flagler. Marion County, Iowa.

Flatrock. Henry County, Ohio.

Flax River. (Little Colorado.)

Fleet Point. Great Wicomico River, Virginia.

Fletcher. Mississippi River, Arkansas.

Fogleman. Mississippi River, Arkansas.

Foldahl. Marshall County, Minnesota.

Foldal. (Foldahl.)

Fords Ferry. Ohio River, Kentucky.

Fords Point. Mississippi River, Mississippi.

Forest City. (Forrest.)

Forestport. Oneida County, New York.

Forestville. Chautauqua County, New York.

Forestville. Fillmore County, Minnesota.

Forrest. St. Francis County, Arkansas.

Forrester Point. St. Johns River, Florida.

Forrestville. (Forestville.)

Fort Recovery. Mercer County, Ohio.

Fort Washington Point. Hudson River, New York.

Fort Wilkinson Island. Mississippi River, Illinois.

Foster Landing. Ohio River, Kentucky.

Foulweather, Cape. Oregon.

Sometimes confused with Yaquina Head, a different point, 6 miles distant to the southward.

Fox Hole Anchorage. Choptank River, Maryland.

Francesville. Pulaski County, Indiana.

Frank Brickey Light. Mississippi River, Illinois.

Frankfort Station. (Frankfort.)

Frankfort. Will County, Illinois.

Frank Landing. Ohio River, Indiana.

Franklin. (Franklintown.) Pennsylvania.

Franklin Centre. (Franklin.) Iowa.

Franklin. Lee County, Iowa.

Franklintown. York County, Pennsylvania.

Frazier Point. Winyaw Bay, South Carolina.

Frederica. (Frederika.)

Frederika. Bremer County, Iowa.

Freeman Rock. East of Great Bass Island, Maine.

Freeman's Ledge. (Freeman Rock.)

Freemason Islands. Chandeleur Sound, Louisiana.

Freemason Keys. (Freemason Islands.)

Fremont. Steuben County, Indiana.

Fremount. (Fremont.)

French. Mississippi River, Kentucky.

French Camp. Choctaw County, Mississippi.

Friar Point. Mississippi River, Mississippi.

Friends Landing. Kanawha River, West Virginia.

Front Range. Colorado.

Fulker Island. Croatan Sound, North Carolina.

Fulker's Island. (Fulker.)

Fuller Rock. Providence River, Rhode Island.

Furgeson Lane. Ohio River, Ohio.

Furgusson. Missouri River, Missouri.

Gaffney. Spartanburg County, South Carolina.

Gaines. Genesee County, Michigan.

Gaines Landing. Mississippi River, Arkansas.

Gaines Station. (Gaines.)

Galatia. Saline County, Illinois.

Gales Ledge. Near Salem, Massachusetts.

Gallatia. (Galatia.)

Galliher Point. Skagit Bay, Washington.

Gardiners Bay. New York.

Gardiners Island. Gardiners Bay, New York.

Gareloi Island. Alaska.

Garfield. (Guilford.)

Gedney Channel. Entrance to Lower Bay, New York.

Gedney's Channel. (Gedney Channel.)

Gees Point. Hudson River, New York.

George. Fayette County, Pennsylvania.

Bank. Atlantic Ocean, off Cape

Shoal. Atlantic Ocean, off
lod.
own. Clay County, Minnesota.
Harrison County, Ohio.
. (German.)
springs. Cowley County, Kan-

oint. North Landing River, Vir-

Landing. Mississippi River.
Point. Potomac River, Mary-

gh Point. (Giesboro.)
Island. Mississippi River, Mis-

ville. Black Hawk County,

le. (Gilbertsville.)
Wharf. Thunder Bay River,
an.
Illinois River, Illinois.
Harbor. South Islesboro, Maine.
Jasper County, Indiana.
Grove. Clay County, Iowa.
Wabasha County, Minnesota.
Mississippi River, Mississippi.
(Gillam.)
on. Buffalo County, Wisconsin.
wn. (Gilmanton.)
ie. Henderson County, Illinois.
k. Mississippi River, Louisiana.
. Scott County, Minnesota.
(Glendale.)
Locks. Ohio River, West Vir-

ter Harbor. Massachusetts.
. (Gnadenhutten.)
nutten. Tuscarawas County,

St. Louis County, Minnesota.
kochev. (Salisbury Sound.)
Mississippi River, Iowa.
. Mississippi River, Arkansas.
Bay. Alaska.
Bay. (Golovin Sound.)
Sound. Alaska.
Sound. (Golovin.)
Bay. (Golofnin.)
Harbor. (Golofnin Bay.)
a. Mississippi River, Louisiana.
ce. Clinton County, Iowa.
Mississippi River, Iowa.
sland. (Gareloi.)

Goresville. (Goreville.)
Goreville. Johnson County, Illinois.
Goroloi Island. (Gareloi.)
Goshen. Rockbridge County, Virginia.
Goshen Bridge. (Goshen.)
Governors Island. New York Harbor.
Grand Glaise. Jackson County, Arkansas.
Grand Glaze. (Grand Glaise.)
Grand Gosier Island. (Errol Island.)
Grandview. Edgar County, Illinois.
Grandview. Louisa County, Iowa.
Grandview. Spencer County, Indiana.
Grandview. Washington County, Ohio.
Grange. Fleming County, Kentucky.
Granny Run. Ohio River, Ohio.
Grant Farm. Indian River, Florida.
Grassy Point. Near Jacksonville, Florida.
Grave. (Grove.)
Graves. (The Graves.)
Graves Ledge. (The Graves.)
Grays. Mississippi River, Missouri.
Grays Reef. Straits of Mackinac, Michigan.
Great Captain Island. Long Island Sound, New York.
Great Diamond Island. Portland Harbor, Maine.
Great Hog Island. (Great Diamond.)
Great Kysa Island. (Kiska.)
Great Kyska Island. (Kiska.)
Great Pedee River. (Pedee River.)
Great Point. Nantucket Island, Massachusetts.
Great Sitchine Island. (Great Sitkin.)
Great Sitkhin Island. (Great Sitkin.)
Great Sitkin Island. West of Atka Island, Alaska.
Great West Bay. (Shinnecock.)
Great Wicomico Bay. (Great Wicomico River.)
Great Wicomico River. Virginia. Empties into Chesapeake Bay at Fleets Point.
Green. Marshall County, Indiana.
Green. Noble County, Indiana.
Green. Randolph County, Indiana.
Green. Hancock County, Indiana.
Green. Grant County, Indiana.
Green. Madison County, Indiana.
Green. Harrison County, Ohio.
Green. Wayne County, Ohio.
Green. Indiana County, Pennsylvania.

Greenbury Point. Severn River, Maryland.
Greencastle. Putnam County, Indiana.
Greencastle. Sullivan County, Missouri.
Greencastle. Fairfield County, Ohio.
Greencastle. Franklin County, Pennsylvania.
Greene. Jay County, Indiana.
Greene. Wayne County, Indiana.
Greene. Clinton County, Pennsylvania.
Greeneville. (Greenville.)
Greenhorn Mountains. (Wet.)
Greenlane. Montgomery County, Pennsylvania.
Greenleaf. Mississippi River, Illinois.
Greenleaf Point. District of Columbia.
Greens. Ohio River, Illinois.
Greensfork. Randolph County, Indiana.
Greens Store Light. Mississippi River, Louisiana.
Greenvale. Dakota County, Minnesota.
Greenville. Meriwether County, Georgia.
Greenwood. Taylor County, Wisconsin.
Greer. Greenville County, South Carolina.
Greers Depot. (Greer). South Carolina.
Gregory Cape. (Arago.)
Grimms Landing. Kanawha River, West Virginia.
Grim's Landing. (Grimms.)
Grindel Point. South Islesboro, Maine.
Grossepoint. Wayne County, Michigan.
Grove. Stearns County, Minnesota.
Grubb Towhead. Tennessee River, Kentucky.
Guadalupe River. San Antonio Bay Texas.
Guadeloupe River. (Guadalupe.)
Guesen. (Gnesen.) Minnesota.
Guilford. Hendricks County, Indiana.
Guilford. (Gillford.) Minnesota.
Guttenberg. Hudson County, New Jersey.
Guttenburg. (Guttenberg.)
Hacker Bend. Mississippi River.
Hackett Point. Annapolis Roads, Maryland.
Hagan. Missouri River, Missouri.
Hagemeister Island. In Bristol Bay, Alaska.
Hagenmeister Island. (Hagemeister.)
Halcomb. (Holcomb.)
Hale Passage. Washington Sound, Washington.
Hale Point. Mississippi River, Tennessee.
Halfmoon. Center County, Pennsylvania.
Halfmoon Shoal. Galveston Bay, Texas.
Halibut Island. (Sannak.)
Halket Cape. (Halkett.)
Halkett, Cape. North coast of Alaska.
Hallets Point. East River, New York.
Halton. (Holton.) Wisconsin.
Hambden. Geauga County, Ohio.
Hamblen. Brown County, Indiana.
Hamblin. (Hamblen.) Indiana.
Hamden Junction. (Hamden.) Ohio.
Hamden. Vinton County, Ohio.
Hampden. (Hambden.) Ohio.
Hancock, Cape. (Disappointment.)
Hanover. (Hanoverton.) Ohio.
Hanoverton. Columbiana County, Ohio.
Harbert Landing. Mississippi River, Mississippi.
Harborcreek. Erie County, Pennsylvania.
Harbor Keys. (Old Harbor Islands.)
Harbour Creek. (Harborcreek.)
Hardenberg. (Hardenburg.)
Hardenburg. Ulster County, New York.
Hardin Point. Mississippi River, Arkansas.
Harding Beach. Nantucket Sound, Massachusetts.
Harding Ledge. Off Point Allerton, Boston Harbor, Massachusetts.
Harford. Susquehanna County, Pennsylvania.
Harkleroad. Mississippi River, Arkansas.
Harlow. Mississippi River, Illinois.
Harper Landing. Illinois River, Illinois.
Harpers Ferry. Jefferson County, West Virginia.
Harpersville. (Harperville.)
Harperville. Scott County, Mississippi.
Harris. Mississippi River, Tennessee.
Harrisburg. Pennsylvania.
Harrison. Tallahatchie County, Mississippi.
Hartford. (Harford.)
Hartford. Mason County, West Virginia.
Hart Island. Chesapeake Bay, Maryland.
Hart Landing. Missouri River, Missouri.
Hartsgrove. Ashtabula County, Ohio.
Hatche Point. (Hatch.)

nt. Kennebec River, Maine.
(Hayward.)
. Fayette County, Iowa.
Point. Patapsco River, Mary-

lays.)
Haley.)
rk County, Nebraska.
ling. Mississippi River, Mis-

. Freeborn County, Minne-

lazle.)
m. (Hazle Green.)
(Hazleton.)
. (Hazlewood.)
luzerne County, Pennsylvania.
sen. Delaware County, Iowa.
Buchanan County, Iowa.
. Barber County, Kansas.
)d. Hamilton County, Ohio.
Island. Missouri River, Mis-

Point. (Hendricks.)
f Acre. Niagara River.
n Bay. Lake Ontario, New

s Head. Sheepscot River,

s Point. Opposite Jackson-
orida.
anding. Columbia River, Ore-

int. Straits of Mackinac, Mich-

1. Dickinson County, Kansas.
). (Herington City.)
Island. North coast of Alaska.
land. (Herschel.)
:hute. Mississippi River, Iowa.
land. St. Clair River, Mich-

Mississippi River, Arkansas.
of Navesink Lights. (Nave-

(Holland.)
1 Rock. Ohio River, Illinois.
1 Shor-. Ohio River, Illinois.
Franklin County, Ohio.
(Hilliard.)
)ve. Sullivan County, Penn-

it. Sturgeon Bay, Wisconsin.
rook. Alaska.
ka. (Hinchinbrook.)

Hinckley Point Spit. St. Lawrence River, New York.
Hinkle. Missouri River, Missouri.
Hitchcock Landing. Ohio River, Ohio.
Hodgdon's Mills. (East Boothbay.)
Hoffman Landing. Columbia River, Washington.
Hog Island. (Appledore.)
Hog Island. (Center.)
Hog Point. Ohio River, Indiana.
Hog Run. Ohio River, West Virginia.
Ho-ka-chat-na River. (Hokuchatna.)
Hokuchatna River. Branch of Koyukuk, Alaska.
Holoomb. Dunklin County, Missouri.
Holland. Kandiyohi County, Minnesota.
Holland Island. Chesapeake Bay, Maryland.
Holland Island Bar. Chesapeake Bay, Maryland.
Holland Straits. Chesapeake Bay, Maryland.
Holt Bar. Ohio River, Indiana.
Holton. Marathon County, Wisconsin.
Honeybrook. Chester County, Pennsylvania.
Hood Canal. Washington.
Hood's Channel. (Hood Canal.)
Hooper Strait. Chesapeake Bay, Maryland.
Hoover Field. Illinois River, Illinois.
Hornblower Point. Albemarle Sound, North Carolina.
Hornblows Point. (Hornblower.)
Horniblows Point. (Hornblower.)
Horseshoe. Chesapeake Bay.
Horseshoe. Upper and lower range, Delaware River.
Horse Shoe. (Horseshoe.)
Horse Shoe Bar. (Horseshoe.)
Horton Point. Long Island, New York.
How. Oconto County, Wisconsin.
Howard. Mississippi River, Missouri.
Howard. Wright County, Minnesota.
Howard Lake. (Howard.)
Howe. (How.)
Howell Cove. Delaware River, New Jersey.
Howell Island. Missouri River, Missouri.
Howkan. Alaska.
Hoytsville. Wood County, Ohio.
Hoytville. (Hoytsville.)

Hubbs Landing. Ohio River, West Virginia.
Hudson River. New York.
Hughes Bar. Ohio River, Indiana.
Humboldt. Coles County, Illinois.
Humbolt. (Humboldt.)
Hunters Cove. Oregon.
Hunt Ledge. Boston Harbor, Massachusetts.
Huntley Grove. (Huntley.)
Huntley. McHenry County, Illinois.
Huntsville. Randolph County, Indiana.
Iamonia. (Town and lake.) Florida.
Iceberg Point. Lopez Island, Washington.
Igitkihn Island. (Igitkin.)
Igitkilm Island. (Igitkin.)
Igitkin Island. Near Great Sitkin Island, Alaska.
Ig-na-look Island. (Little Diomede.)
Ikalik, Cape. (Ikolik.)
Ikogmiut Mission. (Ikogmut.)
Ikogmut Mission. On Yukon River, Alaska.
Ikolik, Cape. On western coast Kadiak Island, Alaska.
Ikti, Cape. Southern coast of Alaska.
Ilioulíouk Village. (Iliuliuk.)
Iliuliuk Village. On Unalaska Island, Alaska.
Imouruk Lake. (Imuruk.)
Imuruk Lake. East of Port Clarence, Alaska.
Indian Spring. Butts County, Georgia.
Ingram Bar. Tennessee River, Kentucky.
Interlaken. Florida.
Invergrove. Dakota County, Minnesota.
Iona. (Ionia). Kansas.
Iona. (Ionia.) Nebraska.
Ionia. Jewell County, Kansas.
Ionia. Dixon County, Nebraska.
Ioulakh Island. (Ulak.)
Irvis. (Irwin.)
Irwin. Venango County, Pennsylvania.
Isanotski Strait. North of Unimak Island, Alaska.
Isanotsky Strait. (Isanotski.)
Islesboro. Town in Maine.
Islesborough. (Islesboro.)
Issannakh Strait. (Isanotski.)
Itkbi Cape. (Ikti.)
Itkhi Cape. (Ikti.)
Jacks Point. Ohio River, Illinois.
Jackson. Alaska. (Howkan.)
James Bayou. Mississippi River, souri.
Janes Island. Tangier Sound, land.
Jefferson. Madison County, Ohio
Jeffrey's Hook. (Fort Wasington P
Jenkins Rock. Straits of Ste. Michigan.
Jennersville. (Jennertown.)
Jennertown. Somerset County, sylvania.
Jennis Point. (Iceberg Point.)
Jerico. Cedar County, Missouri.
Jerico Springs. (Jerico.)
Jeromesville. (Jeromeville.)
Jeromeville. Ashland County, Ol
Jessup. (Jesup.)
Jesup. Wayne County, Georgia.
Joe Brown Spit. (Sandy Point.)
Joe Davies. (Joe Daviess.)
Joe Daviess. Faribault County, nesota.
John Brickey Light. Mississippi Missouri.
Johns Bay. West of Pemaquid Maine.
Johnson. (Johnston.) South Caro
Johnson. Mississippi River, Ten
Johnson. Mississippi River, Illin
Johnson Island. Mississippi Ri
Johnson Island. Sandusky Bay,
Johnson Shoal. Kanawha River Virginia.
Johnston. Edgefield County, S Carolina.
Jones Island. Savannah River, G
Jones Point. Potomac River, Vi
Jordan Point. James River, Vi
J. Q. Adams. (Adams.) Indiana.
Kachekmak Bay. (Kachemak.)
Kachemak Bay. Kenai Penin Alaska.
Kadiak Island. Alaska.
Kaguyak Village. Alaska.
Kaiuklipalik Island. (Kiukpalik.)
Kamchatka Sea. (Bering.)
Kanesville. (Kaneville.)
Kaneville. Kane County, Illinoi
Karankaw a Reef and Point. Te
Karpa Island. West of Kupr Island, Alaska.
Karquinas Strait. (Karquines.)
Karquines Strait. Connecting and San Pablo bays, California.
Karthaus. Clearfield County, Pe vania.

Bay. Alaska.
Bay. (Kashega.)
Bay and Point. Marthas Vine-
assachusetts.
land. Alaska.
Village. (Kaguyak.)
nd. (Kayak.)
. Davis County, Utah.
raits. Chesapeake Bay, Mary-

Island. Lake Erie, Ohio.
Island Reef. Lake Erie, Ohio.
minsula and Fort. Alaska.
insula and Fort. (Kenai.)
Mississippi River, Missouri.
Dewitt County, Illinois.
Kenney.)
nt. Kent Island, Chesapeake
aryland.
(Karthaus,)Pennsylvania.
Monmouth County, New Jer-

Island. (Khwostof Island.)
River. (Chulitna.)
Island. (Khwostof.)
of Island. Alaska.
k Bay. East side Alaska Penin-

Bay. (Kialagvik.)
Store Light. Mississippi
Mississippi.
(Kilbourne.)
e. Mason County, Illinois.
(Kilfoil.)
Custer County, Nebraska.
r. Le Sueur County, Minnesota.
(Kilkenny.)
y. (Kinmundy.)
ee. (Kingegan.)
1. At Cape Prince of Wales,

und. In Bering Strait, Alaska.
nding. Ohio River, Indiana.
and. (King.)
int. (Philips.)
ly. Marion County, Illinois.
Redwood County, Minnesota.
Yukon Delta, Alaska.
(Kipniak.)
anding. Ohio River, Kentucky.
land. Alaska.
tas. (Kiskiminitas.)
itas. Armstrong County,
lvania.
k Island. In Shelikof Strait,

Klein. (Kline.)
Kline. Schuylkill County, Pennsylvania.
Klokacheff. (Salisbury Sound.)
Knapp Landing. Columbia River, Washington.
Knitire. (Kintire.)
Knobnoster. Johnson County, Missouri.
Knox. Illinois River, Illinois.
Knox Bar. Ohio River, Pennsylvania.
Kodiak Island. (Kadiak.)
Kolugru'a River. (Meade.)
Koniougi Island. (Koniuji.)
Koniuji Island. Near Atka Island, Alaska.
Kookpowrook River. (Kukpowruk.)
Koopoowrook River. (Kukpowruk.)
Koos Bay. (Coos.)
Korovenski Bay. (Korovin.)
Korovin Bay. On Atka Island, Alaska.
Korovinskoi Bay. (Korovin.)
Kou Island. (Kuiu.)
Koujulik Bay. (Kujulik.)
Kouloukak Bay. (Kulukak.)
Kouloulak Bay. (Kulukak.)
Kouskokvim River and Bay. (Kuskokwim.)
Koyoukuk River. (Koyukuk.)
Koyukuk River. A branch of the Yukon, Alaska.
Kragnes. (Kragness.)
Kragness. Clay County, Minnesota.
Krusenstern, Cape. Kotzebue Sound, Alaska.
Krusenstern Island. (Little Diomede.)
Kruzenstern, Cape. (Krusenstern.)
Kruzof Island. West of Baranof Island, Alaska.
Kruzoff Island. (Kruzof.)
Kruzov Island. (Kruzof.)
Kuiu Island. West of Kupreanof Island, Alaska.
Kujulik Bay. East side Alaska Peninsula.
Kukpowruk River. Between Cape Lisburne and Icy Cape, Alaska.
Kulichavak River. Between Yukon and Kuskokwim, Alaska.
Ku-ling-mut Cape. (Kuliugmiut.)
Kuliugmiut, Cape. West side Kadiak Island, Alaska.
Ku-liu-kak Bay. (Kulukak.)
Kuliumiut Cape. (Kuliugmiut.)
Kulinycmut Cape. (Kuliugmiut.)
Kullichaha. Indian Territory.
Kulliinla. Indian Territory.
Kulugrua River. (Meade.)

Kuskoswim River and Bay. (Kuskokwim.)
Kuskoquim River and Bay. (Kuskokwim.)
Kutloot. (South Island.)
Kutusoff Cape. (Kutuzof.)
Kutuzof, Cape. West coast Alaska Peninsula.
Kvichavak River. (Kulichavak.)
Kwikhsak. (Kwikpak.)
Kwikpak. In Norton Sound, Alaska.
Kyska Island. (Kiska.)
Lacey Lane. Ohio River, West Virginia.
Lacock Bar. Ohio River, Pennsylvania.
Lac qui Parle. Lac qui Parle County, Minnesota.
La Du Wharf. Columbia River, Washington.
Lafayette. Chambers County, Alabama.
Lafayette. Bremer County, Iowa.
Lafayette. Christian County, Kentucky.
Lafayette. Chippewa County, Wisconsin.
Lagrange. Lagrange County, Indiana.
Lagrange. Penobscot County, Maine.
Lakeport. Woodbury County, Iowa.
Laketown. Carver County, Minnesota.
Lakeville. Dakota County, Minnesota.
Lamar River. Yellowstone Park.
Lambert Point. Elizabeth River, Virginia.
Lamine. Cooper County, Missouri.
Lamonte. Pettis County, Missouri.
Lamphere Dock. Hudson River, New York.
Lee. Mississippi River, Tennessee.
Lee Centre. (Lee.)
Leesburg. Carroll County, Ohio.
Leesville. (Leesburg.)
Lemington. (Leamington.)
Lemmington. (Leamington.)
Leontavitch, Cape. (Leontovich.)
Leontovich, Cape. West side Al Peninsula.
Lester. Mississippi River, Kentucl
Letts. (Lettsville.)
Lettsville. Louisa County, Iowa.
Lewis Fork. (Snake River.)
Libby Island. (Libby Islands.)
Libby Islands. Machias Bay, Mai
Libbey Islands. (Libby.)
Lime Spring. (Limesprings.)
Limesprings. Howard County, Io
Lincoln. Lincoln County, Kansas.
Lincoln Center. (Lincoln.)
Lindon. (Lyndon.)
Lindsborg. McPherson County, Ka
Lindsburg City. (Lindsborg.)
Little Annemessex River. Mary
Little Annemessic. (Little Anneme
Little Colorado River. Arizona.
Little Diamond Island. Port Harbor, Maine.
Little Diomede Island. Alaska.
Little Hog Island. (Little Diamond
Livingston Creek. Hudson River, York.
Lloyd. Ulster County, New York.
Lloyd Harbor. Long Island Sound, York.

ı Grove. Chester County, Pennnia.
ıland Head Light. Boston Harfassachusetts.
'and Light. (Long Island Head.)
ɔadow. Hampden County, ıchusetts.
wamp. Berks County, Pennsyl-
.
:anding. Ohio River, Kentucky.
Peak. Colorado.
e. Shelby County, Ohio.
e. (Lowville.)
. Garfield County, Kansas.
(Lorenz.)
ɜ. (Louriston.)
ı. Carroll County, Ohio.
on. Chippewa County, Minne-
Mill. Columbia River, Washing-
ville. Mahoning County, Ohio.
lle. (Lowell.)
Middle Ground. (Middle Ground.)
Patroon Island. Hudson River, ork.
Bar. Ohio River, Pennsylvania.
le. Murray County, Minnesota.
(Lloyd.)
Mississippi River, Missouri.
ton. (Ludington.)
ton. Eau Claire County, Wis-
ı.
ı Beach. Ludlam Island, New
r.
:k. Westmoreland County, ylvania.
(Ludwick.)
ght. Mississippi River, Louisi-
ıville. Meriwether County, ia.
lle. (Luthersville.)
s. Kossuth County, Iowa.
s. Rock County, Minnesota.
urg. (Luxemburg.)
ɔurg. Kewaunee County, Wis-
ı.
. Crawford County, Ohio.
(Lykens.)
ı. Sheboygan County, Wiscon-
ı. Juneau County, Wisconsin.
anal. Alaska.
annel. (Lynn Canal.)

McAdenville. Gaston County, North Carolina.
McAdensville. (McAdenville.)
McBlair Shoal. Nantucket Sound, Massachusetts.
McCall. (McColl.)
McCall Flat. Mississippi River, Louisiana.
McCameron. Martin County, Indiana.
McCleameron. (McCameron.)
McColl. Marlboro County, South Carolina.
McConnellsville. (McConnelsville.)
McConnelsville. Morgan County, Ohio.
McCullough Bar. Tennessee River, Kentucky.
McCullum Ripple. Ohio River, Kentucky.
McCune. Pike County, Missouri.
McEldowney Bar. Ohio River, West Virginia.
McFarland. Dane County, Wisconsin.
McGees Island. Illinois River, Illinois.
McGulpin Point. Straits of Mackinac, Michigan.
McKenzie Head. Columbia River, Washington.
McKnight. Mississippi River, Iowa.
McLeod Bay. Straits of Mackinac, Michigan.
Macclenny. (Maclenny.)
Macfarland. (McFarland.)
Machir Landing. Ohio River, West Virginia.
Mack Reef. Oregon.
Mackay Island. Currituck Island, North Carolina.
Mackey Point. Savannah River, Georgia.
Mackoy Landing. Ohio River, Kentucky.
Maclenny. Baker County, Florida.
Macnair Islands. St. Lawrence River, New York.
Macsville. Grant County, Minnesota.
Mad River. Clark County, Ohio.
Macsville. (Macsville.)
Magdalen Island. Hudson River.
Mahan. Ohio River, West Virginia.
Mahantongo. (Upper Mahantango.)
Mahon River. Delaware Bay, Delaware.
Maidencreek. Berks County, Pennsylvania.
Main. Columbia County, Pennsylvania.
Maine. (Main.)
Maineville. Warren County, Ohio.

Mainville. (Maineville.)
Makouchinskoy Bay and Volcano. (Makushin.)
Makushin Bay and Volcano. Unalaska Island, Alaska.
Malco. (Marco.)
Manatau. (Manitou.)
Manatu. (Manitou.)
Manby, Point. Entrance to Yakutat Bay, Alaska.
Manitou. A lake in Fulton County, Indiana.
Manitou. El Paso County, Colorado.
Manitou Springs. (Manitou.)
Manly. Moore County, North Carolina.
Manly Station. (Manly.)
Mansfield. Allegheny County, Pennsylvania.
Manaker. Mississippi River, Illinois.
Marco. (Town and pass.) Lee County. Florida.
Margaretville. (Margaretsville.)
Margaretsville. Northampton County, North Carolina.
Margarettsville. (Margaretsville.)
Marine. Washington County, Minnesota.
Marine Mills. (Marine.)
Marr Field Light. Mississippi River, Tennessee.
Marshall. Marshall County, Iowa.
Marshall Point. Herring Gut, Maine.
Marshalltown. (Marshall.)
Martel. (Martell.)
Martell. Pierce County, Wisconsin.
Marthas Vineyard. Massachusetts.
Martha's Vineyard. (Marthas Vineyard.)
Martickville. (Marticville.)
Marticville. Lancaster County, Pennsylvania.
Martins Industry Shoal. Off Port Royal Sound, North Carolina.
Martin Island. Columbia River, Washington.
Martin Reef. Straits of Ste. Marie, Michigan.
Martic. (Marticville.)
Marys River. Mississippi River, Illinois.
Mason Island. Mississippi River, Illinois.
Matamoras. (New Matamoras.)
Matawan. (Matteawan.)
Matomkin Inlet. (Metomkin.)
Matson. Missouri River, Missouri.
Mattapoiset. (Mattapoisett.)
Mattapoisett. Harbor and town, Buzzards Bay, Massachusetts.
Matteawan. Dutchess County, New York.
Maupin. Kanawha River, West Virginia.
Maury Island. Puget Sound, Washington.
Maxfield Point. Lake Memphremagog, Vermont.
Mayday. Riley County, Kansas.
Mayesville. Sumter County, South Carolina.
Mayhew. Lowndes County, Mississippi.
Maylor Spit. Whidbey Island, Washington.
Mayo Beach. Cape Cod Bay, Massachusetts.
Maysville. (Mayesville.) South Carolina.
Mazomanie. Dane County, Wisconsin.
Meade Center. (Meade.)
Meade. Meade County, Kansas.
Meade River. Alaska.
Mechanicsville. (Mechanicville.)
Mechanicville. Saratoga County, New York.
Menominee. Michigan.
Merrill Shell Bank. Mississippi Sound, Mississippi.
Merriman Bar. Ohio River, Pennsylvania.
Merrymeeting Bay. Maine.
Metcalf. (Metcalfe.)
Metcalfe. Thomas County, Georgia.
Metomkin. Inlet and Point, Virginia.
Metompkin Inlet. (Metomkin.)
Mhoon Landing. Mississippi River, Mississippi.
Miami. Hamilton County, Ohio.
Miamitown. (Miami.)
Michaelorski Island. (St. Michael.)
Michigan. Nelson County, North Dakota.
Middlebranch. Stark County, Ohio.
Middlecreek. Snyder County, Pennsylvania.
Middlecreek. Somerset County, Pennsylvania.
Middle Ground. Quoddy Roads, Maine.
Middlepoint. Van Wert County, Ohio.
Middleton. (Middletown.)
Middleton. Wood County, Indiana.
Middletown. (Middleton.)
Middletown. Henry County, Indiana.

. (Millcreek.)
re. Steuben County, Indiana.
. (Millhpim.)
ek. Coshocton County, Ohio.
ek. Clarion County, Pennsyl-

ek. Lebanon County, Pennsyl-

port. Lawrence County, Ohio.
(Millersport.)
re. (Milgrove.)
n. Center County, Pennsylvania.
ns Bend. Mississippi River,
ana.
. (Minster.)
ta. Lyon County, Minnesota.
ta. (Minneota.)
Ledge. Massachusetts.
. Anglaize County, Ohio.
oint. Straits of Ste. Marie, Mich-

. (Mishicott.)
tt. Manitowoc County, Wis-
.
inawa. Darke County, Ohio.
ewa. (Mississinawa.)
(Mitchell.)
ll. Sheboygan County, Wis-
.
l. Mississippi River, Tennessee.
ree. (Mitcheltree.)
tree. Martin County, Indiana.
Island. (Mitkof.)
Island. East of Kupreanof
, Alaska.
Island. (Mitrofania.)
nia Island. East side Alaska
ula.
Island. (Mitkof.)
k Bay. Chesapeake Bay.
k Bay. (Mobjack.)
. County, post-office, and fort
ona; river and desert in Cali-
.
(Mohave.)
koi Bay. (Cold.)
(Molina.)
Pike County, Georgia.
Taylor County, Wisconsin.
. (Monegaw Springs.)
w Springs. St. Clair County,
ri.
(Molitor.)
. Bradford County, Pennsyl-

Monroe, Fort. Virginia.
On February 8, 1828, the Secretary of War ordered that the works at Old Point Comfort be called Fort Monroe, and not Fortress Monroe.
Monroe, Fortress. (Monroe, Fort.)
Monroeton. (Monroe.)
Montclair. Essex County, New Jersey.
Montcer. (Montier.)
Montier. Shannon County, Missouri.
Moore. Mississippi River, Louisiana.
Moore Dock. St. Lawrence River, New York.
Moorefield. Switzerland County, Indiana.
Moore Point. Lake Erie, Ohio.
Moorfield. (Moorefield.)
Moorovskoy Bay. (Cold.)
Moosabec Reach. Maine.
Moosebec. (Moosabec.)
Moran. Allen County, Kansas.
Morantown. (Moran.)
Morgan Bend. Mississippi River, Louisiana.
Morgan Crevasse. Mississippi River, Louisiana.
Morgan Point. Lake Michigan, Illinois.
Morgan Point. Fishers Island Sound, Connecticut.
Morgan Point. Mississippi River, Arkansas.
Morlofski Bay. (Cold.)
Moroskoi Bay. (Cold.)
Morrison. Mississippi River, Missouri.
Morrison Landing. Ohio River, Kentucky.
Morzhovoi Village and Bay. South end Alaska Peninsula.
Morzovia Village and Bay. (Morzhovoi.)
Mt. Haley. Midland County, Michigan.
Mount Holly Springs. Cumberland County, Pennsylvania.
Mountjoy. Adams County, Pennsylvania.
Moweaqua. Shelby County, Illinois.
Mowequa. (Moweaqua.)
Mudds Landing. Mississippi River, Illinois.
Muddycreek. Butler County, Pennsylvania.
Mull Dike. Hudson River, New York.
Mullenville City. (Mullinville.)
Mullinville. Kiowa County, Kansas.
Mull Plaat Island. Hudson River, New York.

Mundy. Mississippi River, Missouri.
Murphy Island. St. Johns River, Florida.
Murphy Island. Mississippi River, Illinois.
Muscle Fork. (Mussel Fork.)
Muscovalley. Mississippi River, Kentucky.
Mussel Fork. Chariton County, Missouri.
Nachamik Island. (Nakchamik.)
Nagai Island. Shumagin Islands, Alaska.
Nagay Island. (Nagai.)
Nagek River and Lake. (Naknek.)
Nagg Island. Maumee Bay, Lake Erie, Ohio.
Nakamik Island. (Nakchamik.)
Nakchamik Island. Semidi Islands, Alaska.
Nakcham-ik Island. (Nakchamik.)
Naknek River and Lake. In Bristol Bay, Alaska.
Nash Island. Pleasant Bay, Maine.
National. (National Springs.)
National Springs. Logan County, Arkansas.
Navesink Lights. New Jersey. Entrance to New York Harbor.
Neal Island. Ohio River, West Virginia.
Ned Point. East Neebish Rapids, Michigan.
Ned Point. Buzzards Bay, Massachusetts.
Neel Landing. Ohio River, Ohio.
Neely. Mississippi River, Missouri.
Neily. Telfair County, Georgia.
Neilly. (Neily.)
Nequasset Lake. Maine.
Nettle. (Nettle Creek.)
Nettle Creek. Randolph County, Indiana.
Nevino. (Nevins.)
Nevins. Vigo County, Indiana.
Newark. Independence County, Arkansas.
Newbern. Hale County, Alabama.
Newbern. Dickinson County, Kansas.
Newbern. Craven County, North Carolina.
Newberne. (Newbern.)
New Berne. (Newbern.)
Newberry. Luce County, Michigan.
Newbold Island. Delaware River, Pennsylvania.
Newburg. (Newberry.)
Newburn. (Newbern.)
Newcastle. Lincoln County, Maine.
Newcastle. Dixon County, Nebraska.
Newcastle. Schuylkill County, Pennsylvania.
Newcomers. (New Comerstown.)
New Comerstown. Tuscarawas County, Ohio.
New Cut-Off Channel. (Cutoff.)
Newman Grove. Madison County, Nebraska.
Newmans. (Newman Grove.)
New Matamoras. Washington County, Ohio.
New Paltz. Ulster County, New York.
New Peltz. (New Paltz.)
Newport. Johnson County, Iowa.
Newport. Attala County, Mississippi.
New Prague. Scott County, Minnesota.
New Redding. (Redding.)
New River. Scott County, Tennessee.
Newsom. Mississippi River, Missouri.
Nice Shoal. Niagara River, New York.
Nichola. Muscatine County, Iowa.
Nikolski Village. On Umnak Island, Alaska.
Nikolsky Village. (Nikolski.)
Nilly. (Neily.)
Nishnabotona. (Nishnabotna.)
Nishnabotna. Atchison County, Missouri.
No-gat-za-ka-kat River. (Hokuchatna.)
Noo-nar-book Island. (Big Diomede.)
Noonivak Island. (Nunivak.)
Noo-wook. (Nuwuk.)
Noowook. (Nuwuk.)
Northeast. Erie County, Pennsylvania.
North Islands. Chandeleur Sound, Louisiana.
North Islesboro. Village in town of Islesboro, Maine.
North Islesborough. (North Islesboro.)
North Keys. (North Islands.)
Northmoreland. Wyoming County, Pennsylvania.
Norths Landing. Ohio River, Indiana.
Northwest. Williams County, Ohio.
Norton Island. Penobscot Bay, Maine.
Norton Island Ledges. Penobscot Bay, Maine.
Nounivak Island. (Nunivak.)
Nuchagak River. (Nushagak.)
Nuniook Island. (Nunivak.)
Nunivak Island. Alaska.
Nushagak River. Flows into Bristol Bay, Alaska.
Nushagok River. (Nushagak.)

. At Point Barrow, Alaska.
idge. Buzzards Bay, Massachu-
s. Monroe County, Wisconsin.
Landing. Ohio River, Ohio.
Lake in Florida.
ee. (Ochlockonee.)
conee. Thomas County, Geor-
iver. (Aucilla.)
(Ocala.)
el. Mississippi River, Arkansas.
. (Ogallala.)
L. Keith County, Nebraska.
anding. Ohio River, Kentucky.
oint. Coast of Maine.
(Otay.)
int. (Ogier.)
ee. Indian Territory.
bor Islands. Chandeleur Sound,
ana.
bor Key. (Old Harbor Islands.)
id Crossing. Ohio River, Ken-
id Place. Whitehall Narrows,
Champlain, Vermont.
i. (Saint Francis.)
Reef. Pamlico Sound, North
na.
hka Island. (Unalaska.)
River and Village. (Ugashik.)
book Island. (King.)
-book Island. (King.)
Island. (Umnak.)
a Island. (Unalaska.)
Island. (Unimak.)
ie. Near Point Barrow, Alaska.
ic. (Ootkeavie.)
raville.)
. Jackson County, Illinois.
ape. (Blanco.)
oint. Long Island, New York.
oint. Cape Fear River, North
na.
. Jefferson County, Kansas.
(Osborne.)
. Pipestone County, Minnesota.
Point. (Pawcatuck.)
Clearfield County, Pennsylva-
fills. (Osceola.)
Polk County, Wisconsin.
lley. San Diego County, Cali-
Cowley County, Kansas.

Otter Creek. Vigo County, Indiana.
Oumakh Island. (Umak.)
Oumnak Island. (Umnak.)
Ounalashka Island. (Unalaska.)
Ounimak Island. (Unimak.)
Overeisel. (Overisel.)
Overisel. Allegan County, Michigan.
Owls Head. Rockland Harbor, Maine.
Oyster Ponds Point. (Orient.)
Ozawkie. (Osawkie.)
Padanaram. Massachusetts.
Padanarum. (Padanaram.)
Paddy Hen Light. Mississippi River, Tennessee.
Palmer Island. Buzzards Bay, Massachusetts.
Panola. Woodford County, Illinois.
Panola Station. (Panola.)
Parish Dock. St. Lawrence River, New York.
Paris Landing. Ohio River, Indiana.
Parker. Armstrong County, Pennsylvania.
Parker Landing. Mississippi River, Missouri.
Parkersville. (Parkerville.)
Parkerville. Morris County, Kansas.
Parkinson Landing. Ohio River, Illinois.
Parsons Bar. Mississippi River, Wisconsin.
Paso de Robles. (Paso Robles.)
Paso Robles. San Luis Obispo County, California.
Pattersonville. (Patterson.)
Patterson. St. Mary County Louisiana.
Pawcatuck Point. Mouth of Pawcatuck River, southeast corner of Connecticut.
Pawnee. Pawnee County, Nebraska.
Peace River. Florida.
Pease. (Peace.)
Peck Lake. Indian River, Florida.
Pedee River. South Carolina.
Peedee River. (Pedee.)
Peepee. Pike County, Ohio.
Peirce, Cape. West of Hagemeister Island, Alaska.
Penn Manor. Delaware River, Pennsylvania.
Pentwater. Oceana County, Michigan.
Peoples. Boone County, Iowa.
Pequanac. (Pequannoc.)
Pequannoc. Morris County, New Jersey.
Percy Reach. Hudson River, New York.

Perrysville. (Perryville.)
Perry Towhead. Mississippi River, Illinois.
Perryville. Ashland County, Ohio.
Peters Island. Mississippi River, Arkansas.
Peters Landing. Ohio River, Kentucky.
Peters Towhead. Mississippi River, Arkansas.
Petit Manan Island and Point. Maine.
Petmeg e'a River. (Pitmegea.)
Petty. Mississippi River, Arkansas.
Petty Island. Opposite Philadelphia, Delaware River, New Jersey.
Peyton Landing. Ohio River, Ohio.
Philips Point. St. Johns River, Florida.
Phillips Bar. Mississippi River, Missouri.
Phillip's Point. (Philips.)
Phippsburg. Sagadahoc County, Maine.
Phipsburg. (Phippsburg.)
Pierce, Cape. (Peirce.)
Pierceton. Kosciusko County, Indiana.
Pierceton Junction. (Pierceton.)
Pig Eye Dike. Mississippi River, Minnesota.
Pig Eye Light. Mississippi River, Minnesota.
Pilcher Point. Mississippi River, Louisiana.
Pinecreek. Jefferson County, Pennsylvania.
Pine Grove. Schuylkill County, Pennsylvania.
Pinik Island. (Punuk.)
Pitmegea River. East of Cape Lisburne, Alaska.
Pittsburg. Pennsylvania.

The city was chartered in 1816, its name being spelled without the *h*, and its official form is still Pittsburg. The *h* appears to have been added by the Post-Office Department, and through that action local usage appears to have become divided. While the majority of local newspapers print it without the *h*, certain others use the final *h*.

Pittsgrove. Salem County, New Jersey.
Plaingrove. Lawrence County, Pennsylvania.
Pleasant Mound. Blue Earth, Minnesota.
Plum. Venango County, Pennsylvania.
Plumer. (Plum.)
Plummer. (Plum.)
Pocomoke. Worcester County, land.
Po[illegible]**Reef.** Straits of Mackinac, Mic
Point Arena. Coast of Californi
Point Comfort Beacon. New . New York Lower Bay.
Point Harbor. (Sorrento Harbor.
Point No Point. Puget Sound, ington.
Point-no-Point. (Point No Point.
Polk. Polk County, Iowa.
Polk Landing. Mississippi Riv sissippi.
Pollocksville. (Polloksville.)
Polloksville. Jones County, Nor olina.
Poncha Springs. Chaffee Coun orado.
Poncho Springs. (Poncha Spring
Pooles Island. Chesapeake Bay
Pope. Panola County, Mississip
Popof Island. Shumagin Islands,
Portage. St. Charles County, Miss
Portage des Sioux. (Portage.)
Port Chester Harbor. Mouth of River, Long Island Sound.
Port Townsend. Washington.
Port Townshend. (Port Townsend
Port William. Clinton County,
Post of Arkansas. (Arkansas Pos
Poudre. (Cache la Poudre.)
Powder. (Cache la Poudre.)
Powel. (Powell.)
Powell. Jefferson County, Nebr
Powell Point. Lake Superior, Mi
Poysippi. Waushara County, Wis
Prague. (New Prague.)
Prairieview. Wilkin County, Min
Presidents Island. Mississippi Missouri.
Pribilof Islands. Alaska.
Pribylov Islands. (Pribilof.)
Price. Missouri River, Missouri.
Price Creek. Cape Fear River, Carolina.
Prince William Sound. Alask
Prior Island. Ohio River, Illino
Proctor Landing. Ohio River, Virginia.
Provo River. Utah.
Pullman Shoal. St. Lawrence New York.
Punta Arenas. (Point Arena.)

Rasa. Florida.
discarded form is a recent corrupon of the original Spanish form.
'asa. (Punta Rasa.)
Island. Near St. Lawrence
l, Alaska.
Run. Ohio River, Ohio.
n Bluff. Mississippi River, Mispi.
Bay. (Quoddy Roads.)
y Roads. Maine.
t Back Peak. Straits of Mack-Michigan.
oint. St. Johns River, Florida.
d. Starke County, Indiana.
d. York County, Pennsylvania.
anding. Ohio River, Indiana.
; Mt. Washington.
C. H. (Beckley.)
y. Kossuth County, Iowa.
ar. Randolph County, North ina.
(Ramsay.)
a. Buncombe County, North ina.
s. (Ramseur.)
l Wharf Light. Back Creek, land.
ph Point. Mississippi River, ssee.
annock Spit. Chesapeake Bay.
nd. (Khwostof.)
nd. (Semisopochnoi.)
off Island. (Big Diomede.)
s. (Ravenna.)
n. (Ravenden Springs.)
len Springs. Randolph County, sas.
ta. Dakota County, Minnesota.
s. Mills County, Iowa.
r Point. Lake Michigan, Wis-s.
(Rawles.)
s. (Ramoth.)
Wabasha County, Minnesota.
r. (Fort Recovery.)
ak. Armstrong County, Pennnia.
ak. Clarion County, Pennsyl-

Point. St. Johns River, below onville, Florida.
g. Ringgold County, Iowa.
r. Jay County, Indiana.
nding. Mississippi River, Illi-

Redoubt Volcano. West side Cook Inlet, Alaska.
Reeder Point. Columbia River, Oregon.
Reed Landing. Ohio River, Kentucky.
Reed Point. Straits of Ste. Marie, Michigan.
Reeds. (Reads.)
Reeds Landing. Wabasha County, Minnesota.
Reiley. (Reily.)
Reily. Butler County, Ohio.
Reppert Bar. Ohio River, Ohio.
Reverton. (Riverton.)
Revillagigedo Channel and Island. Alaska.
Richardson Landing. Ohio River, Kentucky.
Ridgbury. (Ridgebury.)
Ridgebury. Bradford County, Pennsylvania.
Ridgely. Nicollet County, Minnesota.
Ridgeway. (Ridgway.)
Ridgley. (Ridgely.)
Ridgway. Gallatin County, Illinois.
Rikers Island. East River, New York.
Riley. Vigo County, Indiana.
Riley. (Reily.)
Riley Landing. Mississippi River, Tennessee.
Rinearson Point. Columbia River, Oregon.
Rio Colorado. (Colorado River.)
Ripley. Jackson County, West Virginia.
Rivers Landing. Mississippi River, Louisiana.
Riverton. Clay County, Minnesota.
Robard. Henderson County, Kentucky.
Robbins Reef. New York Bay, New York and New Jersey.
Robinson Point. Puget Sound, Washington.
Robson. Mississippi River, Mississippi.
Rochanoff Lake. (Becharof.)
Rockhill. Bucks County, Pennsylvania.
Rockmart. Polk County, Georgia.
Rogers, Mount. (Elliott Knob.)
Rolland. Isabella County, Michigan.
Rollingstone. Winona County, Minnesota.
Romain, Cape. South Carolina.
Roman, Cape. (Romain.)
Romantzof, Cape and Mountains. (Romanzof.)
Romantsoff, Cape and Mountains. (Romanzof.)

Romanzof, Cape and Mountains. West coast of Alaska.
Rome. (Roome.)
Romer Shoal. New York Lower Bay.
Rood Landing. Columbia River, Washington.
Roome. Polk County, Minnesota.
Roseclair. (Rosiclare.)
Roselle. Carroll County, Iowa.
Rosemont. (Rosemount.)
Rosemount. Dakota County, Minnesota.
Rosiclare. Hardin County, Illinois.
Rosselle. (Roselle.)
Roulet. (Roulette.)
Roulette. Potter County, Pennsylvania.
Round Hill Light. (Dumpling Rock.)
Rouse Point. Lake Champlain, New York.
Rowland. (Rolland.)
Rowland Landing. Ohio River, Ohio.
Roxana. (Roxand.)
Roxand. Eaton County, Michigan.
Royersford. Montgomery County, Pennsylvania.
Rumiantzoff, Cape and Mountains. (Romanzof.)
Russell Island. St. Clair River, Michigan.
Ryan. (Ryon.)
Ryon. Schuylkill County, Pennsylvania.
Sabine Point. Providence River, Rhode Island.
Sacketts Harbor. Lake Ontario, New York.
Sackett's Harbor. (Sacketts Harbor.)
Saddleback Ledge. Penobscot Bay, Maine.
Saegerstown. Crawford County, Pennsylvania.
Saint Clair. (Sinclair.)
Saint Clairsville. Bedford County, Pennsylvania.
Saint Francis. St. Johns River, Florida.
St. Andrew Sound. Georgia.
St. Catherine Bend. Mississippi River, Louisiana.
St. Clement Bay. Potomac River, Maryland.
St. Croix Island. (Dochet Island.)
St. Croix River. Maine.
St. Gabriel Church. Mississippi River, Louisiana.
St. George Harbor. Maine.
St. George Reef. Off Point St. George, California.
St. George River. Maine.
St. George's Bank. (Georges Bank.)
St. George Sound. East of Apalachicola Bay, Florida.
St. Helen. Roscommon County, Michigan.
St. Helens, town, mountain, and river. Oregon and Washington.
St. Hellens. (St. Helens.)
St. Hilaire. Polk County, Minnesota.
St. Johns Village. Clinton County, Michigan.
St. Johns River. Florida.
St. Joseph Island. Mississippi Sound, Mississippi.
St. Laurence Island. (St. Lawrence Island.)
St. Lawrence Island. Bering Sea.
Sainte Marie. Jasper County, Illinois.
Saint Marie. (Sainte Marie.)
St. Marks. Florida.
St. Martin Island. Lake Michigan, Wisconsin.
St. Martinsville. St. Martin Parish, Louisiana.
St. Marys Bend. Mississippi River, Missouri.
St. Marys River. Michigan.
St. Marys River. Cumberland Sound, Florida.
St. Mathew Island. (St. Matthew.)
St. Matthew Island. Alaska.
St. Michael Island. In Norton Sound, Alaska.
St. Simon Island and Sound. Georgia.
Salamonia. (Salamonie.)
Salamonie. Huntington County, Indiana.
Salawik Lake. (Selawik.)
Salisbury Sound. North of Kruzof Island, Alaska.
Sallys. Aiken County, South Carolina.
Salmon Bay. Puget Sound, Washington.
Sampsell. Livingston County, Missouri.
Sanachno Cape. (West Cape.)
Sanackno Cape. (West Cape.)
Sanak Island. (Sannak.)
Sandnes. (Saunes.)
Sands Point. Long Island Sound, New York.
Sandy Point. (Wescott.)
Sandy Point. (West.)
Sandy Point. (Great Point.)
Sandy Point. Washington.
Sannakh Island. (Sannak.)

land. Southeast of Unimak,

Yellow Medicine County,
a.
ver. (San Pitch.)
River. Utah.
Sergeant.)
Indian Territory.
(Sausalito.)
Roads. (Saulston.)
Wayne County, North Caro-

Point. Green Bay, Wisconsin.
A post-office in California.
land. Willamette River,

anding. Ohio River, Ohio.
(Savannah.)
. Butler County, Nebraska.
Hodgeman County, Kansas.
lend. Mississippi River, Mis-

Waushara County, Wis-

Saxeville.)
Skandia.)
g. (Schaumberg.)
. (Schleisingerville.)
eff Inlet. (Shishmaref.)
gerville. (Schleisingerville.)
Cove. Lake Huron, Michigan.
Mississippi River, Arkansas.
org. Cook County, Illinois.
gerville. Washington County,
in.
Ledge. Off Sakonnet Point,
sland.
rille. Saratoga County, New

lle. (Schuylerville.)
Light Vessel. Approaches
York.
ff. Mississippi River, Louis-

L. Edgar County, Illinois.
idle Ground. Detroit River,
n.
nt Shoal. Lake Erie, Ohio.
ock. Connecticut River, Con-

Island. Mississippi River,

ock. Massachusetts.
k. (Searle.)
and. Penobscot Bay, Maine.

Sebocis. Penobscot County, Maine.
Sebocis. (Sebocis.)
Seeley. (Seely.)
Seely. Guthrie County, Iowa.
Seguam Island. Alaska.
Selawik Lake. Near Kotzebue Sound, Alaska.
Se-le-wik Lake. (Selawik.)
Selins Grove. Snyder County, Pennsylvania.
Sellers Landing. Ohio River, Illinois.
Semedi Islands. (Semidi.)
Semichi Islands. Western Aleutian Islands, Alaska.
Semidi Islands. Alaska.
Semisopoch Island. (Semisopochnoi.)
Semisopochnoi Island. Alaska.
Semisopokh Island. (Semisopochnoi.)
Semitkhi Islands. (Semichi.)
Sequatchie. Valley, river, county, and town, Tennessee.
Sequoya. Indian Territory.
Sergeant. McKean County, Pennsylvania.
Servis. Mississippi River, Mississippi.
Seven Islands. (Semidi.)
Seward. Kosciusko County, Indiana.
Shackelford. Saline County, Missouri.
Shackleford. (Shackelford.)
Shagwamigon. (Chequamegon.)
Shaokatan. Lincoln County, Minnesota.
Shaokaton. (Shaokatan.)
Sharkfin Shoal. Chesapeake Bay, Maryland.
Sharon. Hamilton County, Ohio.
Sharonville. (Sharon.)
Sharps Island. Chesapeake Bay, Maryland.
Sharrodsville. (Sherrodsville.)
Shaw Island. Near Cape Douglas, Alaska.
Shaws Island. (Shaw.)
Shaw's Island. (Shaw.)
Shaws Island. Grand Lake, Louisiana.
Sheepscot River. Maine.
Sheepscott River. (Sheepscot.)
Sheets Ripple. Ohio River, Ohio.
Shelly. (Shelby.)
Shelby. Shelby County, Indiana.
Shelton. (Skelton.)
Sherman Cove. Penobscot Bay, Maine.
Sherodsville. (Sherrodsville.)
Sherrodsville. Carroll County, Ohio.
Shilshole Bay. Puget Sound, Washington.

Shinnecock Bay. South shore of Long Island, New York.

Shinnicock Bay. (Shinnecock.)

Shishmaref Inlet. Northeast of Cape Prince of Wales, Alaska.

Shismareff Inlet. (Shishmaref.)

Shoalwater Bay. (Willapa.)

Shoemaker Island. St. Lawrence River, New York.

Shumagin Islands. Off east side Alaska Peninsula.

Shuyak Island. North of Afognak and Kadiak Island.

Siegel. (Sigel.)

Sierra Shoshone. (Absaroka.)

Sigel. Wood County, Wisconsin.

Signam Island. (Seguam.)

Siguam Island. (Seguam.)

Sikhinak Island. (Sitkinak.)

Silver Lake. Kosciusko County, Indiana.

Simenoff Island. (Simeonof.)

Simeonof Island. Alaska.

Simitkhi Islands. (Semichi.)

Simmons Reef. Lake Michigan, Michigan.

Sinclair. Jewell County, Kansas.

Sitchinak Island. (Sitkinak.)

Sitkinak Island. South of Kadiak Island, Alaska.

Sithinak Island. (Sitkinak.)

Siverly. Venango County, Pennsylvania.

Siverlyville. (Siverly.)

Skandia. Murray County, Minnesota.

Skelton. Warrick County, Indiana.

Skiatook. Indian Territory.

Slaughtersville. Webster County, Kentucky.

Slaughterville. (Slaughtersville.)

Sleepy Eye. Brown County, Minnesota.

Slipperyrock. Lawrence County, Pennsylvania.

Slipperyrock. Butler County, Pennsylvania.

Slippe Stein Island. (Magdalen.)

Smith Bar. Mississippi River, Minnesota.

Smithburg. (Smithsburg.)

Smith Chain. Mississippi River, Illinois.

Smith Island. Cape Charles, Virginia.

Smith Island. Cape Fear River, North Carolina.

Smith Island. Strait of Juan de Fuca, Washington.

Was discovered by Eliza in 1791, and named Isla de Bonilla. It was named Blunts Island by Wilkes in 1841. Upon the British Admiralty chart of 1847 it was called Smith's Island. It is now generally known by the latter name. Pacific Coast Pilot, 1889, p. 552.

Smith Landing. Ohio River, Ohio.

Smith Landing. Mississippi River, Minnesota.

Smithsburg. Washington County, Maryland.

Snake River. Idaho.

Snakespring. Bedford County, Pennsylvania.

Snody Dock. Whitehall Narrows, Lake Champlain, New York.

Snoddy's Dock. (Snody.)

Snow Marsh. Cape Fear River, North Carolina.

Solem. Douglas County, Minnesota.

Solomons Lump. Kedge Straits, Chesapeake Bay, Maryland.

Solum. (Solem.)

Somerford. Madison County, Ohio.

Somers Cove. Little Annemessex River, Maryland.

Sorrento Harbor. Coast of Maine.

South Bloomfield. Pickaway County, Ohio.

South Bunker Ledge. Approaches to southwest harbor, Mt. Desert, Maine.

Southerland. (Sutherland.)

Southeast Farallon. California.

South Farallon. (Southeast Farallon.)

South Island. One of the Semidi Islands, Alaska.

South Newmarket. Rockingham County, New Hampshire.

South New Market Junction. (South Newmarket.)

Southport. Marion County, Indiana.

Southwest. Warren County, Pennsylvania.

Southwest. McDonald County, Missouri.

Spalding. (Spaulding.)

Spaulding. Union County, Iowa.

Spears Rock. Rockland Harbor, coast of Maine.

Specht Ferry. Mississippi River, Iowa.

Spencer. Jennings County, Indiana.

e. Washington.
Falls. (Spokane.)
ank. Dixon County, Nebraska.
oro. Crawford County, Penn-
ia.
orough. (Springboro Borough.)
lale. Dane County, Wisconsin.
lale. Hamilton County, Ohio.
Harden. York County, Pennsyl-

ills. Champaign County, Ohio.
oint. Hudson River, New York.
rs Creek. Orange County, In-

Creek. (Stampers Creek.)
Island. Missouri River, Mis-

d Rock. Lake Superior, Michi-

urst. Seward County, Nebraska.
urst. (Staplehurst.)
ca. Wayne County, Pennsyl-

. (Starrucca.)
y. (Steele.)
Jefferson County, Nebraska.
le. (Steeleville.)
ille. Randolph County, Illinois.
Knox County, Indiana.
k Bay. South side Alaska
ula.
ho Bay. (Stepovak.)
(Seward.)
t Island. Ohio River, Kentucky.
River. (Stikine.)
Steen.)
iver. (Stikine.)
River. Alaska.
n Slough. Illinois River, Illi-

rt. Saline County, Illinois.
k. Clermont County, Ohio.
Slough. Mississippi River, Illi-

reek. (Stonycreek.)
reek. Henry County, Indiana.
reek. Somerset County, Penn-
ia.
anding. Ohio River, Kentucky.
vn. (Stoystown.)
wn. Somerset County, Penn-
ia.
nville. Clarion County, Penn-
ia.
Missouri River, Missouri.

Stribling Point. Straits of Ste. Marie, Michigan.
Strogonof Point. Western coast of Alaska Peninsula.
Strognoff Point. (Strogonof.)
Strogonov Point. (Strogonof.)
Suchitna River. (Sushitna.)
Suchitno River. (Sushitna.)
Sugarcreek. Armstrong County, Pennsylvania.
Sugarcreek. Venango County, Pennsylvania.
Sugarloaf. Luzerne County, Pennsylvania.
Sugarloaf. Columbia County, Pennsylvania.
Sulima River and Village. (Ugashik.)
Sullivans Island. Charleston Harbor, South Carolina.
Summerford. (Somerford.)
Summerset. Adair County, Iowa.
Summersett. (Summerset.)
Summitville. Madison County, Indiana.
Sushitna River. Cook Inlet, Alaska.
Susquehanna. Susquehanna County, Pennsylvania.
Sutherland. O'Brien County, Iowa.
Sutkwik Island. (Sutwik.)
Sutschitna River. (Sushitna.)
Sutton. Leelanaw County, Michigan.
Suttons Bay. (Sutton.)
Sutwik Island. North of Semidi Islands, Alaska.
Suvaroff Village. (Suworof.)
Suwanee. Gwinnett County, Georgia.
Suwarof Village. (Suworof.)
Suworof Village. Bristol Bay, Alaska.
Sverdrup. Ottertail County, Minnesota.
Swan Island. Approaches to Blue Hill Bay, Maine.
Swannee. (Suwanee.)
Swerdrup. (Sverdrup.)
Symes. (Synnes.)
Synnes. Stevens County, Minnesota.
Tacoma, Mt. (Rainier.)
Taiya Inlet. North of Chilkoot Inlet, Alaska.
Tallmadge. Ottawa County, Michigan.
Tally Point. (Tolly.)
Talmadge. (Tallmadge.)
Tama. Tama County, Iowa.
Tanner Run. Ohio River, Ohio.
Tara. Swift County, Minnesota.
Tarpley. Mississippi River, Mississippi.
Tatum. Marlboro County, South Carolina.

Tatum Station. (Tatum.)
Taylor. Lafayette County, Mississippi.
Tchefuncta River. (Chefuncte.)
Tchefuncte River. (Chefuncte.)
Tchegoula Island. (Chugul.)
Tchigul Island. (Chigul.)
Tchitchagoff Harbor. (Chichagof.)
Tchitnak Cape. (Chitnak.)
Tchuginadak Island. (Chuginadak.)
Tenmile. Macon County, Missouri.
Tennant Harbor. Maine.
Tenpound Island. Gloucester Harbor, Massachusetts.
Ten Pound Island. (Tenpound.)
Ten-pound Island. (Tenpound.)
Terrel Landing. Ohio River, Kentucky.
Thatcher Island. Massachusetts.
Thatcher's Island. (Thatcher Island.)
The Graves. Coast of Maine.
The Graves. Entrance to Boston Harbor, Massachusetts.
The Nub. (Bald Rock.)
The Nubble Light. (Cape Neddick.)
Thomas. Mississippi River, Tennessee.
Thomas Point Shoal. Chesapeake Bay, Maryland.
Thompson. Bullock County, Alabama.
Thompson. Mississippi River, Missouri.
Thompsons Station. (Thompson.)
Thompsontown. Juniata County, Pennsylvania.
Thompsonville. (Thompsontown.)
Thomson. Susquehanna County, Pennsylvania.
Thorn. Perry County, Ohio.
Thorne. (Thorn.)
Thornton. Cook County, Illinois.
Thornton Station. (Thornton.)
Throgs Neck. Long Island Sound, New York.
Tibbetts Point. St. Lawrence River, New York.
Timberhill. Bourbon County, Kansas.
Timpanógos River. (Provo.)
Tinicum Island. Delaware River, Pennsylvania.
Tinicum Islands. (Tinicum Island.)
Tinney. Ray County, Missouri.
Tirzah. York County, South Carolina.
Tisdel Towhead. Mississippi River, Illinois.
Tobia. (Tobin.)
Tobin. Perry County, Indiana.
Tod. Huntingdon County, Pennsylvania.
Todd. (Tod.)
Tokna. (Tokua.)
Tokua. Big Stone County, Minnesota.
Toler Landing. Mississippi River, Kentucky.
Tolly Point. Chesapeake Bay, Maryland.
Tom Nevers Head. Nantucket Island, Massachusetts.
Toms Run. Ohio River, West Virginia.
Tony Towhead. Mississippi River, Missouri.
Too's Point. (Tue.)
Towamencin. (Towamensing.)
Towamensing. Montgomery County, Pennsylvania.
Townesville. (Townsville.)
Towns End. (Townsend Gut.)
Townsend Gut. Coast of Maine.
Townsville. Vance County, North Carolina.
Tracy. (Troy.)
Tread Haven River. (Tred Avon.)
Tred Avon River. Maryland.
Tred Haven Creek. (Tred Avon River.)
Trimbelle. Pierce County, Wisconsin.
Trotter Landing. Mississippi River, Mississippi.
Troupe. Smith County, Texas.
Troy. Pipestone County, Minnesota.
Tschitschagoff Harbor. (Chichagof.)
Tucker Beach. Below Barnegat Inlet, New Jersey.
Tue Point. Mouth of York River, Virginia.
Tunnelhill. Whitfield County, Georgia.
Tunnelhill. Cambria County, Pennsylvania.
Turbot. (Turbut.)
Turbotville. (Turbutville.)
Turbut. Northumberland County, Pennsylvania.
Turbutville. Northumberland County, Pennsylvania.
Turnage. Mississippi River, Arkansas.
Turnbull Island. Red River, Louisiana.
Turner. Mississippi River, Illinois.
Turney. Clinton County, Missouri.
Tuskahoma. Indian Territory.
Twelvemile. Madison County, Missouri.
Twin Lake. (Twin Lakes.)
Twin Lakes. Calhoun County, Iowa.
Tyya Inlet. (Taiya.)
Ugaiuschak Island. (Ugaiushak.)
Ugaiusha Island. (Ugaiushak.)
Ugaiushak Island. North of Semidi Islands, Alaska.

Ugashik River and Village. West coast Alaska Peninsula.
Ugumok Island. (Chirikof.)
Ukivok Island. (King.)
Uinta Mountains. Utah.
Uintah Mountains. (Uinta.)
Ulak Island. Alaska.
Ulakch Island. (Ulak.)
Ulen. Clay County, Minnesota.
Ulm. (Ulen.)
Umak Island. Alaska.
Umnak Island. Alaska.
Umpqua River. Oregon.
Umpquah River. (Umpqua.)
Unalashka Island. (Unalaska.)
Unalaska Island. Aleutian Islands, Alaska.
Unalishagvak Cape. East side Alaska Peninsula.
Unalishogvak Cape. (Unalishagvak.)
Unimak Island. Alaska.
Union. (Uniontown.)
Uniontown. Fayette County, Pennsylvania.
Unionville Center. Union County, Ohio.
Unionville Center. (Unionville.)
Upper Cedar Point. Potomac River.
Upper Iowa River. Iowa.
Upper Mahantango. Schuylkill County, Pennsylvania.
Upper Uwchlan. Chester County, Pennsylvania.
Uwchland. (Upper Uwchlan.)
Vanada Landing. Ohio River, Kentucky.
Vancil. Mississippi River, Illinois.
Vanhorn. Benton County, Iowa.
Van Sickle Island. Sacramento River, California.
Van Wies Point. Hudson River, New York.
Verdery. Abbeville County, South Carolina.
Verdigre. Knox County, Nebraska.
Verdigris. (Verdigre.)
Verdrey. (Verdery.)
Vermilion. Edgar County, Illinois.
Victory. (Victory Mills.)
Victory Mills. Saratoga County, New York.
Vidal Shoal. Straits of Ste. Marie, Michigan.
Vinalhaven. Knox County, Maine.
Vineland. (Vinland.)
Vinland. Winnebago County, Wisconsin.
Veeridoff. (Vsevidof.)
Vsevidof. Unimak Island, Alaska.
Waackaack Beacon. New York Lower Bay.
Wade Hampton. Mississippi River, Louisiana.
Wade Point. Albemarle Sound, North Carolina.
Wahsatch Range. (Wasatch.)
Walaka. (Welaka.)
Walcott. Rice County, Minnesota.
Walden Ridge. Tennessee.
Walke Point. North Landing River, Virginia.
Walker Bar. Ohio River, Illinois.
Walker Island Bar. Columbia River, Oregon.
Walker Landing. Ohio River, Ohio.
Wallen's Ridge. (Walden.)
Walmough Head. (Watmough Head.)
Walmouth Head. (Watmough Head.)
Walmouth Hill. (Watmough Head.)
Wank's Point. (Walke.)
Ward Landing. Ohio River, Ohio.
Warfield Point. Mississippi River, Mississippi.
Warner. Mississippi River, Minnesota.
Warrior Rock. Columbia River, Washington.
Warriorsmark. Huntingdon County, Pennsylvania.
Wasatch Range. Utah.
Water Gap. (Delaware Water Gap.)
Waters Landing. Mississippi River, Illinois.
Waters Point. Mississippi River, Illinois.
Watertown. (Watterstown.)
Watmough Head. Lopez Island, Washington.
Watterstown. Grant County, Wisconsin.
Watts Island. Tangier Sound, Chesapeake Bay, Virginia.
Wauhillau. Indian Territory.
Waukechon. Shawano County, Wisconsin.
Wauk's Point. (Walke.)
Waukechon. (Waukechon.)
Weakeyever River. (Wekiva.)
Webb Landing. Kanawha River, West Virginia.
Wekiva River. Florida.
Welaka. Putnam County, Florida.

Wellfleet Bay. (Wellfleet Harbor.)
Wellfleet Harbor. Cape Cod, Massachusetts.
Wells. (Wills.)
Wells Island. Ohio River, Ohio.
Wequetequock Cove and River. Connecticut.
Wescott Point. Chesapeake Bay, Virginia.
Wessen. (Wesson.)
Wesson. Copiah County, Mississippi.
Westbank. Swift County, Minnesota.
Westburg. Buchanan County, Iowa.
Westbury. (Westburg.)
West Cape. West end of St. Lawrence Island, Alaska.
Westchester. Butler County, Ohio.
West Cliff. (Westcliffe.)
Westcliffe. Custer County, Colorado.
West Jefferson. (Jefferson.)
West Mill Grove. Wood County, Ohio.
West Point. Puget Sound, Washington.
Westside. Crawford County, Iowa.
Wet Mountains. Colorado.

This short range was originally known while the country was under Spanish dominion as Cuerno Verde. Subsequent to the treaty of Guadaloupe Hidalgo the translation of the name came into use. The origin of the name Wet Mountains is not known, but in local usage it has nearly supplanted the name Greenhorn, and appears upon the Land Office maps and the Hayden Atlas.

Wetumka. Indian Territory.
Wewoka. Indian Territory.
Whaleback. Portsmouth Harbor, New Hampshire.
Whaleback Shoal. Green Bay, Wisconsin.
Whaleback Shoal. St. Lawrence River, New York.
Whipple Point. Lake Memphremagog, Vermont.
Whist Landing. Missouri River Missouri.
White Bear. (White Bear Lake.)
White Bear Lake. Ramsey County, Minnesota.
Whitehead Dock. Raritan River, New Jersey.
Whitepain. Montgomery County, Pennsylvania.
Whitepaine. (Whitepain.)
Whites Ripple. Ohio River, Pennsylvania.
Whitewater. Walworth County, Wisconsin.
Whitewater. Cape Girardeau County, Missouri.
Whitney. Mississippi River, Illinois.
Whitpain. (Whitepain.)
Wicketequock River. (Wequetequock.)
Wicomico Bay. (Wicomico River.)
Wicomico River. Maryland. Empties into the Potomac River, near Blakistone Island.
Widow Reynolds Bar. Tennessee River, Kentucky.
Wilds Island. Mississippi River, Minnesota.
Wilkesbarre. Luzerne County, Pennsylvania.
Wilkinson Island. Mississippi River, Illinois.
Willapa Bay. Washington.
Willapah Bay. (Willapa.)
Will Creek. Ohio River, West Virginia.
Williams. Dauphin County, Pennsylvania.
Williamsbridge. Westchester County, New York.
Williams Landing Shoal. Lake Superior, Michigan.
Williamstown. (Williams.)
Williams River. Arizona.
Willmont. Nobles County, Minnesota.
Willow. (Willows.)
Willows. Colusa County, California.
Wills. Laporte County, Indiana.
Wilmont. (Willmont.)
Wilson Beacon. (Waackaack.)
Wilson Point. Mississippi River, Missouri.
Wilton. Muscatine County, Iowa.
Wilton Junction. (Wilton.)
Winchester. (Canal Winchester.)
Windmill Point Shoals. (Rappahannock Spit.)
Winetka. (Winnetka.)
Wings Neck. Buzzards Bay, Massachusetts.
Winnetka. Cook County, Illinois.
Winter Harbor. (Wood Island.)
Winters Landing. Mississippi River, Wisconsin.
Withers Mill. Marion County, Missouri.

Witten Towhead. Ohio River, Ohio.
Wolasaluk Village. (Wolasatux.)
Wolasatux Village. On the Yukon River, Alaska.
Wolcott. (Walcott.)
Wolf Bar. Ohio River, Ohio.
Wolf Trap Light. Chesapeake Bay, Maryland.
Wolf Trap Shoal. (Wolf Trap Spit.)
Wolf Trap Spit. Chesapeake Bay, Maryland.
Wolf Trap Spit Light. (Wolf Trap Light.)
Wononsco Pond. Connecticut.
Wood Island Harbor. At mouth of Saco River, Maine.
Woodlawn. Jefferson County, Illinois.
Woodruff. Marion County, Indiana.
Woodruff. Spartanburg County, South Carolina.
Woodruff Place. (Woodruff.)
Woods Holl. Harbor and village, Massachusetts.

The name which was originally Wood's Hole was changed several years ago by the summer residents of the place to Wood's Holl. This change has been accepted in official and local usage and by the Post-Office Department.

Wood's Hole. (Woods Holl.)
Wood's Holl. (Woods Holl.)
Wreck of the Scotland Light Vessel. (Scotland.)
Wyanett. Isanti County, Minnesota.
Wyanette. (Wyanett.)
Wylie. Mississippi River, Louisiana.
Yakatat Bay. (Yakutat.)
Yakiao Cape. (Yaktag.)
Yaktag, Cape. South coast of Alaska.
Yaktaga Cape. (Yaktag.)
Yakutat Bay. Coast of Alaska.
Yalaha. Lake County, Florida.
Yallaha. (Yalaha.)
Yellowstone Range. (Absaroka.)
Yampa River. Colorado.
Yaquina Head. Oregon.
Yaquinna Head. (Yaquina Head.)
Yates. Luzerne County, Pennsylvania.
Yatesville. (Yates.)
Yeager. Missouri River, Missouri.
Youlak Island. (Ulak.)
Younaska Island. (Yunaska.)
Youngs Point. Mississippi River, Louisiana.
Youngs Store. (Youngs.)
Youngs. Laurens County, South Carolina.
York. Sumter County, Alabama.
York Nubble Light. (Cape Neddick.)
York Station. (York.)
Yunaska Island. Alaska.

NAMES IN FOREIGN COUNTRIES.

Accra. (Akkra.)
Akkra. West Africa.
Alacrane Island. (Alacran Reef.)
Alacrane Reef. (Alacran Reef.)
Alacran Island. (Alacran Reef.)
Alacran Reef. Bank of Campeche, Gulf of Mexico.
Alacran Shoal. (Alacran Reef.)
Algeciras. Town in Spain on Bay of Gibraltar.
Algeziras. (Algeciras.)
Anjer. West coast of Java, Strait of Sunda.
Anjier. (Anjer.)
Annabon Island. (Annobon.)
Anno Bom Island. (Annobon.)
Annobon Island. Gulf of Guinea, West Africa.
Aracan Province and City. (Arakan.)
Arakan Province and City. Burmah, Asia.
Arracan Province and City. (Arakan.)
Arrakan Province and City. (Arakan.)
Aruba Island. (Oruba.)
Arzroom. (Erzerum.)
Aspinwall. (Colon.)
As Rocas. A dangerous reef in the South Atlantic Ocean, 125 miles northeast of Cape St. Roque, Brazil.
Assini. West Africa.
Assinia. (Assini.)
Assinie. (Assini.)
Auckland. A province and town of New Zealand. A group of islands in the South Pacific, south of New Zealand. A bay of British Burma.
Aukland. (Auckland.)
Azores. North Atlantic Ocean.
Baireuth. Town in Bavaria.
Bairout. (Beirut.)
Bairouth. (Beirut.)
Bairut. (Beirut.)

Balouchistan. (Baluchistan.)
Baluchistan. India.
Barbados Island. In West Indies.
Barbadoes Island. (Barbados.)
Bayreuth. (Baireuth.)
Beiroot. (Beirut.)
Beirout. (Beirut.)
Beirouth. (Beirut.)
Beirut. Town in Syria, on Mediterranean Sea.
Beloochistan. (Baluchistan.)
Belouchistan. (Baluchistan.)
Belutchistan. (Baluchistan.)
Bermuda. A group of small islands in the Western Atlantic Ocean. Called Bermudas after Juan Bermudes, a Spanish mariner, who discovered them in 1515. In 1609 Admiral Sir George Somers, R. N., in the "Sea Venture" found them uninhabited. He was wrecked and died there, and the islands were called after him by his companions, "Somers Islands." Bermuda has been adopted as the British official usage, and is the popular and all but universal designation.
Bermudas. (Bermuda.)
Berout. (Beirut.)
Berut. (Beirut.)
Beyroot. (Beirut.)
Beyrout. (Beirut.)
Beyrouth. (Beirut.)
Bonaire. (Buen Ayre.)
Bourbon. (Reunion.)
Bridgetown. Barbados Island.
British Caffraria. (British Kaffraria.)
British Kaffraria. South Africa.
Buen Ayre. Island in Caribbean Sea.
Cabo Santo. (Cape Haitien.)
Cachemire. (Kashmir.)
Callinger. (Kalinjar.)
Camaroon. (Kamerun.)
Cameroon. (Kamerun.)
Cape de Verde Islands. (Cape Verde.)
Cape Francais. (Cape Haitien.)
Cape Haitien. Seaport town on the north coast of the island of Haiti.
Cape Haytien. (Cape Haitien.)
Cape Henri. (Cape Haitien.)
Cape Henry. (Cape Haitien.)
Cape Town. Southwest coast of Africa.
Cape-town. (Cape Town.)
Cape Verde Islands. Atlantic Ocean.
Cape Verd. (Verde, Cape.)
Cape Verd Islands. (Cape Verde.)
Carical. (Karikal.)
Carrical. (Karikal.)
Casamance. (Kasamanze.)
Casamanza. (Kasamanze.)
Casamanse. (Kasamanze.)
Cashmere. (Kashmir.)
Chile, Republic of. South America.
Chili, Republic of. (Chile.)
Colombia, Republic of. South America.
Colon. A city and free port on the Atlantic coast of the Isthmus of Panama, Republic of Colombia, founded in 1850 by the Panama Railroad Company, and named for William H. Aspinwall, one of the railroad company's principal shareholders, and afterwards president of the Pacific Mail Steamship Company. The official name given the city by the Colombian Government is Colon, the Spanish form of the patronymic of Christopher Columbus. Designated as Aspinwall by the United States Government from the year of its foundation until 1882. The Colombian name was adopted in the latter year and has since appeared in the printed diplomatic and consular list of the Department of State as "Colon (Aspinwall)," "Colon" being recognized as the proper form, and "Aspinwall" added in parentheses merely for the purpose of distinguishing the place for the guidance of persons unfamiliar with the Colombian name.

A. H. A.

Columbia. (Colombia.)
Congo River and State. (Kongo.)
Curaçao Island. Caribbean Sea.
Curacoa Island. (Curaçao.)
Dehli. (Delhi.)
Delgada. (Ponta Delgada.)
Delhi. City and district of India, in the Punjab.
Delli. (Delhi.)
Diarbekr. City in Asiatic Turkey.
Diarbekir. (Diarbekr.)
Dilli. (Delhi.)
Durban. South Africa.
Ersirum. (Erzerum.)
Erzeroum. (Erzerum.)
Erzerum. Town in Armenia, Asiatic Turkey.
Erzroom. (Erzerum.)
Erzroum. (Erzerum.)
Feejee Islands. (Fiji.)
Fidschi Islands. (Fiji.)
Fiji Islands. South Pacific.

Foochow. (Fuchau.)
Fuchau. Formosa Strait, China.
Fukchau. (Fuchau.)
Galle. (Point de Galle.)
Gaudeloupe Island. (Guadeloupe.)
Guadeloupe Island. West Indies.
Haiti, Republic of. West Indies.
Haiti Island. West Indies.

Haiti was the native name of the island when Columbus landed on December 6, 1492, and called it Espagnola, which was latinized into Hispaniola. The French colony which gained control of a part of the island was called Saint Domingue, and in 1795, when France acquired the title to the entire island by treaty with Spain, it was called Saint Domingue, but when the French were driven out, and independence declared in 1804, the aboriginal name Haiti was revived by the negroes. Shortly after this the Spaniards reëstablished themselves in the eastern part of the island, retaining the French name modified to Santo Domingo, but in 1821 lost control, and from 1822 to 1843 the whole island was under one government as the Republic of Haiti.

In 1844 the eastern portion of the island again asserted its independence of Haiti and established the Dominican Republic, which remains to the present day.

Thus to-day the island of Haiti, which seems to be the proper name, consists of two countries, Haiti on the west end and Santo Domingo on the east end, the dividing line being drawn from the river Pedernales on the south to the river Massacre on the north coast.

R. C.

Hawaii Islands. (Hawaiian Islands.)
Hawai Islands. (Hawaiian Islands.)
Hawaiian Islands. North Pacific Ocean.
Hayti. (Haiti.)
Helgoland Island. North Sea.
Heligoland Island. (Helgoland.)
Hispaniola. (Haiti.)
Hongkong. China.
Hong Kong. (Hongkong.)
Hong-kong. (Hongkong.)
Hudson Bay. Canada.
Hudson's Bay. (Hudson.)
Ile de la Reunion. (Réunion.)
Isla de Pinos. West Indies, near west end of Cuba.
Isle of Pines. (Isla de Pinos.)
Jaffa. (Yafa.)
Jakutsk. (Yakutsk.)
Japho. (Yafa.)
Jeddo. (Tokyo.)
Joppa. (Yafa.)
Joppe. (Yafa.)
Kachemir. (Kashmir.)
Kachmir. (Kashmir.)
Kalinjar. Town and hill in Bandansa, Banda district, Bundelkhand, British India.
Kalleemjur. (Kalinjar.)
Kallindshur. (Kalinjar.)
Kallinger. (Kalinjar.)
Kamerun. West Africa.
Kara Amid. (Diarbekr.)
Karikal. French settlement in India.
Kasamanze. River of Senegambia, west coast of Africa.
Kaschemir. (Kashmir.)
Kashemir. (Kashmir.)
Kashmir. Native state of India, in northwest Hindustan.
Khorya Morya Island and Bay. East Africa.
Kongo River and State. West Africa.
Kuria Muria Island and Bay. (Khorya Morya.)
Kurian Murian Island and Bay. (Khorya Morya.)
Las Rocas. (As Rocas.)
Mascat. (Maskat.)
Maskat. Arabia, Asia.
Massaouah. (Massaua.)
Massaua. A town on an island of the same name in the Red Sea.
Massawa. (Massaua.)
Massouah. (Massaua.)
Massowah. (Massaua.)
Massua. (Massaua.)
Massuah. (Massaua.)
Mehollan. (Mulholland.)
Meholland. (Mulholland.)
Moucawwa. (Massaua.)
Moussaouah. (Massaua.)
Mulholland Point. Campobello Island, New Brunswick.
Muncepoor. (Munjpur.)
Muneepoor. (Munjpur.)
Munipoor. (Munjpur.)

Munjpur. British India.
Musawwa. (Massaua.)
Muscat. (Maskat.)
Muskat. (Maskat.)
Oruba Island. In Caribbean Sea.
Oude. (Oudh.)
Oudh. British India.
Paita. Seaport town of Peru.
Pandjab. (Punjab.)
Panjab. (Punjab.)
Parahiba. River, city, and maritime province of Brazil.
Parahyba. (Parahiba.)
Paraiba. (Parahiba.)
Paranahiba. River of Brazil; joins the Curumba to form the Parana.
Paranahyba. (Paranahiba.)
Parana-Iba. (Paranahiba.)
Payta. (Paita.)
Pinos Island. (Isla de Pinos.)
Point de Galle. Ceylon, Indian Ocean.
Pointe de Galle. (Point de Galle.)
Ponta Delgada. Town on the island of San Miguel, Azores.
Ponte Delgada. (Ponta Delgada.)
Port Natal. (Durban.)
Porto Rico Island. (Puerto Rico.)
Puerto Rico Island. West Indies.
Punjab. British India.
Punjaub. (Punjab.)
Punto Gallo. (Point de Galle.)
Rajpootana. (Rajputana.)
Rajputana. British India.
Ravandiz. (Rowandiz.)
Réunion. An island in the Indian Ocean, belonging to France.
Rocas. (As Rocas.)
Rovandiz. (Rowandiz.)
Rowandiz. Town in Asiatic Turkey.
Rowandus. (Rowandiz.)
Saint Croix Island. West Indies.
Saint-Domingue Island. (Haiti.)
St. Laurence Bay. (St. Lawrence Bay.)
St. Lawrence Bay. East Cape, Siberia.
Salvador. One of the Central American States.
San Domingo Island. (Haiti.)
Sandwich Islands. (Hawaiian Islands.)
San Juan de Uloa. (San Juan de Ulua.)
San Juan de Ulua. Old fort near Vera Cruz, Mexico.
San Salvador. (Salvador.)
Santa Cruz. (Saint Croix Island.)
Santo Domingo Island. (Haiti.)
Scind. (Sind.)
Scinde. (Sind.)
Scinde. (Sindhia.)
Sind. Province of British India, at its western extremity, under the government of Bombay.
Not to be confounded with the Sindhia Country (Gwalior State), a native dependent state, which lies to the eastward in central India.
Sinde. (Sind.)
Sinde. (Sindhia.)
Sindh. (Sind.)
Sindh. (Sindhia.)
Sindhia. British India.
Sindia. (Sindhia.)
Sindy. (Sindhia.)
Somali Coast. East Africa.
Somauli coast. (Somali.)
Somer's Islands. (Bermuda.)
Tabago Island. (Tobago.)
The Alacranes. (Alacran Reef.)
Tobago Island. West Indies.
Tokei. (Tokyo.)
Tokio. (Tokyo.)
Tokyo. Capital city of Japan.
Tristan da Cunha Island. In South Atlantic.
Tristan d'Acunou Island. (Tristan da Cunha.)
Verde, Cape. West coast of Africa.
Viti, Islands. (Fiji.)
Walfisch Bay. West Africa.
Walfish Bay. (Walfisch.)
Walvisch Bay. (Walfisch.)
Walvish Bay. (Walfisch.)
Western Islands. (Azores.)
Wilson Channel. North Channel, Canada.
Yafa. Town in Palestine, on the Mediterranean Sea.
Yaffa. (Yafa.)
Yakootsk. (Yakutsk.)
Yakoutsk. (Yakutsk.)
Yakutsk. Town in East Siberia, left bank of Lena River.
Yeddo. (Tokyo.)
Yedo. (Tokyo.)

APPENDIX B.

DECISIONS OF THE BOARD.

LIST OF COUNTIES IN THE UNITED STATES.

ALABAMA.
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Marengo.
Marion.
Marshall.
Mobile.
Monroe.
Montgomery.
Morgan.
Perry.
Pickens.
Pike.
Randolph.
Russell.
St. Clair.
Shelby.
Sumter.
Talladega.
Tallapoosa.
Tuscaloosa.
Walker.
Washington.
Wilcox.
Winston.

ARIZONA.

Apache.
Cochise.
Gila.
Graham.
Maricopa.
Mohave.
Pima.
Pinal.
Yavapai.
Yuma.

ARKANSAS.

Arkansas
Ashley.
Baxter.
Benton.
Boone.
Bradley.
Calhoun.
Carroll.
Chicot.
Clark.
Clay.
Cleburne.
Cleveland.
Columbia.
Conway.
Craighead.
Crawford.
Crittenden.
Cross.
Dallas
Desha.
Drew.
Faulkner.
Franklin.
Fulton.
Garland.
Grant.
Greene.
Hempstead.
Hot Spring.
Howard.
Independence.
Izard.
Jackson.
Jefferson.
Johnson.
Lafayette.
Lawrence.
Lee.
Lincoln.
Little River.
Logan.
Lonoke.
Madison.
Marion.
Miller.
Mississippi.
Monroe.
Montgomery.
Nevada.
Newton.
Ouachita.
Perry.
Phillips.
Pike.
Poinsett.
Polk.
Pope.
Prairie.
Pulaski.
Randolph.
St. Francis.
Saline.
Scott.
Searcy.
Sebastian.
Sevier.
Sharp.
Stone.
Union.
Van Buren.
Washington.
White.
Woodruff.
Yell.

CALIFORNIA.

Alameda.
Alpine.
Amador.
Butte.
Calaveras.
Colusa.
Contra Costa.
Del Norte.
Eldorado.
Fresno.
Humboldt.
Inyo.
Kern.
Lake.
Lassen.
Los Angeles.
Marin.
Mariposa.
Mendocino.
Merced.
Modoc.
Mono.
Monterey.
Napa.
Nevada.
Orange.
Placer.
Plumas.
Sacramento.
San Benito.
San Bernardino.
San Diego.
San Francisco.
San Joaquin.
San Luis Obispo
San Mateo.
Santa Barbara.
Santa Clara.
Santa Cruz.
Shasta.
Sierra.
Siskiyou.
Solano.
Sonoma.
Stanislaus.
Sutter.
Tehama.
Trinity.
Tulare.
Tuolumne.
Ventura.
Yolo.
Yuba.

COLORADO.

Arapahoe.
Archuleta.
Baca.
Bent.
Boulder.
Chaffee.
Cheyenne.
Clear Creek.
Conejos.
Costilla.
Custer.
Delta.

Dolores.
Douglas.
Eagle.
Elbert.
El Paso.
Fremont.
Garfield.
Gilpin.
Grand.
Gunnison.
Hinsdale.
Huerfano.
Jefferson.
Kiowa.
Kit Carson.
Lake.
La Plata.
Larimer.
Las Animas.
Lincoln.
Logan.
Mesa.
Montezuma.
Montrose.
Morgan.
Otero.
Ouray.
Park.
Phillips.
Pitkin.
Prowers.
Pueblo.
Rio Blanco.
Rio Grande.
Routt.
Saguache.
San Juan.
San Miguel.
Sedgwick.
Summit.
Washington.
Weld.
Yuma.

CONNECTICUT.

Fairfield.
Hartford.
Litchfield.
Middlesex.
New Haven.
New London.
Tolland.
Windham.

DELAWARE.

Kent.
Newcastle.
Sussex.

FLORIDA.

Alachua.
Baker.
Bradford.
Brevard.
Calhoun.
Citrus.
Clay.
Columbia.
Dade.
De Soto.
Duval.
Escambia.
Franklin.
Gadsden.
Hamilton.
Hernando.
Hillsboro.
Holmes.
Jackson.
Jefferson.
Lafayette.
Lake.
Lee.
Leon.
Levy.
Liberty.
Madison.
Manatee.
Marion.
Monroe.
Nassau.
Orange.
Osceola.
Pasco.
Polk.
Putnam.
St. John.
Santa Rosa.
Sumter.
Suwannee.
Taylor.
Volusia.
Wakulla.
Walton.
Washington.

GEORGIA.

Appling.
Baker.
Baldwin.
Banks.
Bartow.
Berrien.
Bibb.
Brooks.
Bryan.
Bulloch.
Burke.
Butts.
Calhoun.
Camden.
Campbell.
Carroll.
Catoosa.
Charlton.
Chatham.
Chattahoochee.
Chattooga.
Cherokee.
Clarke.
Clay.
Clayton.
Clinch.
Cobb.
Coffee.
Colquitt.
Columbia.
Coweta.
Crawford.
Dade.
Dawson.
Decatur.
Dekalb.
Dodge.
Dooly.
Dougherty.
Douglas.
Early.
Echols.
Effingham.
Elbert.
Emanuel.
Fannin.
Fayette.
Floyd.
Forsyth.
Franklin.
Fulton.
Gilmer.
Glascock.
Glynn.
Gordon.
Greene.
Gwinnett.
Habersham.
Hall.
Hancock.
Haralson.
Harris.
Hart.
Heard.
Henry.
Houston.
Irwin.
Jackson.
Jasper.
Jefferson.
Johnson.
Jones.
Laurens.
Lee.
Liberty.
Lincoln.
Lowndes.
Lumpkin.
McDuffie.
McIntosh.
Macon.
Madison.
Marion.
Meriwether.
Miller.
Milton.
Mitchell.
Monroe.
Montgomery.
Morgan.
Murray.
Muscogee.
Newton.
Oconee.
Oglethorpe.
Paulding.
Pickens.
Pierce.
Pike.
Polk.
Pulaski.
Putnam.
Quitman.
Rabun.
Randolph.
Richmond.
Rockdale.
Schley.
Screven.
Spalding.
Stewart.
Sumter.
Talbot.
Taliaferro.
Tattnall.
Taylor.
Telfair.
Terrell.
Thomas.
Towns.
Troup.
Twiggs.
Union.
Upson.
Walker.
Walton.
Ware.
Warren.
Washington.
Wayne.
Webster.
White.
Whitfield.
Wilcox.
Wilkes.
Wilkinson.
Worth.

IDAHO.

Ada.
Alturas.
Bear Lake.
Bingham.
Boise.
Cassia.
Custer.
Elmore.
Idaho.
Kootenai.
Latah.
Lemhi.
Logan.
Nez Perces.
Oneida.
Owyhee.
Shoshone.
Washington.

ILLINOIS.

Adams.
Alexander.
Bond.
Boone.
Brown.
Bureau.
Calhoun.
Carroll.
Cass.
Champaign.
Christian.
Clark.
Clay.
Clinton.
Coles.
Cook.
Crawford.
Cumberland.
Dekalb.
Dewitt.
Douglas.
Dupage.
Edgar.
Edwards.
Effingham.
Fayette.
Ford.
Franklin.
Fulton.
Gallatin.
Greene.
Grundy.
Hamilton.
Hancock.
Hardin.
Henderson.
Henry.
Iroquois.
Jackson.
Jasper.
Jefferson.
Jersey.
Jo Daviess.
Johnson.
Kane.
Kankakee.
Kendall.
Knox.
Lake.
Lasalle.
Lawrence.
Lee.
Livingston.
Logan.
McDonough.
McHenry.
McLean.
Macon.
Macoupin.
Madison.
Marion.
Marshall.
Mason.
Massac.
Menard.

Grant.
Greene.
Hamilton.
Hancock.
Harrison.
Hendricks.
Henry.
Howard.
Huntington.
Jackson.
Jasper.
Jay.
Jefferson.
Jennings.
Johnson.
Knox.
Kosciusko.
Lagrange.
Lake.
Laporte.
Lawrence.
Madison.
Marion.
Marshall.
Martin.
Miami.
Monroe.
Montgomery.
Morgan.
Newton.
Noble.
Ohio.
Orange.
Owen.
Parke.
Perry.
Pike.
Porter.
Posey.
Pulaski.
Putnam.
Randolph.
Ripley.
Rush.
St. Joseph.
Scott.
Shelby.
Spencer.
Starke.
Steuben.
Sullivan.
Switzerland.
Tippecanoe.
Tipton.
Union.
Vanderburg.
Vermilion.
Vigo.
Wabash.
Warren.
Warrick.
Washington.
Wayne.
Wells.
White.
Whitley.

IOWA.

Adair.
Adams.
Allamakee.
Appanoose.
Audubon.
Benton.
Blackhawk.
Boone.
Bremer.
Buchanan.
Buena Vista.
Butler.
Calhoun.
Carroll.
Cass.
Cedar.
Cerro Gordo.
Cherokee.
Chickasaw.
Clarke.
Clay.
Clayton.
Clinton.
Crawford.
Dallas.
Davis.
Decatur.
Delaware.
Des Moines.
Dickinson.
Dubuque.
Emmet.
Fayette.
Floyd.
Franklin.
Fremont.
Greene.
Grundy.
Guthrie.
Hamilton.
Hancock.
Hardin.
Harrison.
Henry.
Howard.
Humboldt.
Ida.
Iowa.
Jackson.
Jasper.
Jefferson.
Johnson.
Jones.
Keokuk.
Kossuth.
Lee.
Linn.
Louisa.
Lucas.
Lyon.
Madison.
Mahaska.
Marion.
Marshall.
Mills.
Mitchell.
Monona.
Monroe.
Montgomery.
Muscatine.
O'Brien.
Osceola.
Page.
Palo Alto.
Plymouth.
Pocahontas.
Polk.
Pottawattamie.
Poweshiek.
Ringgold.
Sac.
Scott.
Shelby.
Sioux.
Story.
Tama.
Taylor.
Union.
Van Buren.
Wapello.
Warren.
Washington.
Wayne.
Webster.
Winnebago.
Winneshiek.
Woodbury.
Worth.
Wright.

KANSAS.

Allen.
Anderson.
Atchison.
Barber.
Barton.
Bourbon.
Brown.
Butler.
Chase.
Chautauqua.
Cherokee.
Cheyenne.
Clark.
Clay.
Cloud.
Coffey.
Comanche.
Cowley.
Crawford.
Decatur.
Dickinson.
Doniphan.
Douglas.
Edwards.
Elk.
Ellis.
Ellsworth.
Finney.
Ford.
Franklin.
Garfield.
Geary.
Gove.
Graham.
Grant.
Gray.
Greeley.
Greenwood.
Hamilton.
Harper.
Harvey.
Haskell.
Hodgeman.
Jackson.
Jefferson.
Jewell.
Johnson.
Kearny.
Kingman.
Kiowa.
Labette.
Lane.
Leavenworth.
Lincoln.
Linn.
Logan.
Lyon.
McPherson.
Marion.
Marshall.
Meade.
Miami.
Mitchell.
Montgomery.
Morris.
Morton.
Nemaha.
Neosho.
Ness.
Norton.
Osage.
Osborne.
Ottawa.
Pawnee.
Phillips.
Pottawatomie.
Pratt.
Rawlins.
Reno.
Republic.
Rice.
Riley.
Rooks.
Rush.
Russell.
Saline.
Scott.
Sedgwick.
Seward.
Shawnee.
Sheridan.
Sherman.
Smith.
Stafford.
Stanton.
Stevens.

Sumner.
Thomas.
Trego.
Wabaunsee.
Wallace.
Washington.
Wichita.
Wilson.
Woodson.
Wyandotte.

KENTUCKY.

Adair.
Allen.
Anderson.
Ballard.
Barren.
Bath.
Bell.
Boone.
Bourbon.
Boyd.
Boyle.
Bracken.
Breathitt.
Breckinridge.
Bullitt.
Butler.
Caldwell.
Calloway.
Campbell.
Carlisle.
Carroll.
Carter.
Casey.
Christian.
Clark.
Clay.
Clinton.
Crittenden.
Cumberland.
Daviess.
Edmonson.
Elliott.
Estill.
Fayette.
Fleming.
Floyd.
Franklin.
Fulton.
Gallatin.
Garrard.
Grant.
Graves.
Grayson.
Green.
Greenup.
Hancock.
Hardin.
Harlan.
Harrison.
Hart.
Henderson.
Henry.
Hickman.
Hopkins.
Jackson.
Jefferson.
Jessamine.
Johnson.
Kenton.
Knott.
Knox.
Larue.
Laurel.
Lawrence.
Lee.
Leslie.
Letcher.
Lewis.
Lincoln.
Livingston.
Logan.
Lyon.
McCracken.
McLean.
Madison.
Magoffin.
Marion.
Marshall.
Martin.
Mason.
Meade.
Menifee.
Mercer.
Metcalfe.
Monroe.
Montgomery.
Morgan.
Muhlenberg.
Nelson.
Nicholas.
Ohio
Oldham.
Owen.
Owsley.
Pendleton.
Perry.
Pike.
Powell.
Pulaski.
Robertson.
Rockcastle.
Rowan.
Russell.
Scott.
Shelby.
Simpson.
Spencer.
Taylor.
Todd.
Trigg.
Trimble.
Union.
Warren.
Washington.
Wayne.
Webster.
Whitley.
Wolfe.
Woodford.

LOUISIANA.

Acadia.
Ascension.
Assumption.
Avoyelles.
Bienville.
Bossier.
Caddo.
Calcasieu.
Caldwell.
Cameron.
Catahoula.
Claiborne.
Concordia.
De Soto.
East Baton Rouge.
East Carroll.
East Feliciana.
Franklin.
Grant.
Iberia.
Iberville.
Jackson.
Jefferson.
Lafayette.
Lafourche.
Lincoln.
Livingston.
Madison.
Morehouse.
Natchitoches.
Orleans.
Ouachita.
Plaquemines.
Pointe Coupee.
Rapides.
Red River.
Richland.
Sabine.
St. Bernard.
St. Charles.
St. Helena.
St. James.
St. John the Baptist.
St. Landry.
St. Martin.
St. Mary.
St. Tammany.
Tangipahoa.
Tensas.
Terrebonne.
Union.
Vermilion.
Vernon.
Washington.
Webster.
West Baton Rouge.
West Carroll.
West Feliciana.
Winn.

MAINE.

Androscoggin.
Aroostook.
Cumberland.
Franklin.
Hancock.
Kennebec.
Knox.
Lincoln.
Oxford.
Penobscot.
Piscataquis.
Sagadahoc.
Somerset.
Waldo.
Washington.
York.

MARYLAND.

Allegany.
Anne Arundel.
Baltimore.
Baltimore City.
Calvert.
Caroline.
Carroll.
Cecil.
Charles.
Dorchester.
Frederick.
Garrett.
Harford.
Howard.
Kent.
Montgomery.
Prince George.
Queen Anne.
St. Mary.
Somerset.
Talbot.
Washington.
Wicomico.
Worcester.

MASSACHUSETTS.

Barnstable.
Berkshire.
Bristol.
Dukes.
Essex.
Franklin.
Hampden.
Hampshire.
Middlesex.
Nantucket.
Norfolk.
Plymouth.
Suffolk.
Worcester.

MICHIGAN.

Alcona.
Alger.
Allegan.
Alpena.
Antrim.
Arenac.
Baraga.
Barry.
Bay.
Benzie.
Berrien.
Branch.
Calhoun.
Cass.
Charlevoix.
Cheboygan.
Chippewa.
Clare.
Clinton.
Crawford.
Delta.
Eaton.
Emmet.
Genesee.
Gladwin.
Gogebic.
Grand Traverse.
Gratiot.
Hillsdale.
Houghton.
Huron.
Ingham.
Ionia.
Iosco.
Iron.
Isabella.
Isle Royal.
Jackson.
Kalamazoo.
Kalkaska.
Kent.
Keweenaw.
Lake.
Lapeer.
Leelanaw.
Lenawee.
Livingston.
Luce.
Mackinac.
Macomb.
Manistee.
Manitou.
Marquette.
Mason.
Mecosta.
Menominee.
Midland.
Missaukee.
Monroe.
Montcalm.
Montmorency.
Muskegon.
Newaygo.
Oakland.
Oceana.
Ogemaw.
Ontonagon.
Osceola.
Oscoda.
Otsego.
Ottawa.
Presque Isle.
Roscommon.
Saginaw.
St. Clair.
St. Joseph.
Sanilac.
Schoolcraft.

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NNESOTA.

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Renville.
Rice.
Rock.
St. Louis.
Scott.
Sherburne.
Sibley.
Stearns.
Steele.
Stevens.
Swift.
Todd.
Traverse.
Wabasha.
Wadena.
Waseca.
Washington.
Watonwan.
Wilkin.
Winona.
Wright.
Yellow Medicine.

MISSISSIPPI.

Adams.
Alcorn.
Amite.
Attala.
Benton.
Bolivar.
Calhoun.
Carroll.
Chickasaw.
Choctaw.
Claiborne.
Clarke.
Clay.
Coahoma.
Copiah.
Covington.
De Soto.
Franklin.
Greene.
Grenada.
Hancock.
Harrison.
Hinds.
Holmes.
Issaquena.
Itawamba.
Jackson.
Jasper.
Jefferson.
Jones.
Kemper.
Lafayette.
Lauderdale.
Lawrence.
Leake.
Lee.
Leflore.
Lincoln.
Lowndes.
Madison.
Marion.
Marshall.
Monroe.
Montgomery.
Neshoba.
Newton.
Noxubee.
Oktibbeha.
Panola.
Pearl River.
Perry.
Pike.
Pontotoc.
Prentiss.
Quitman.
Rankin.
Scott.
Sharkey.
Simpson.
Smith.
Sunflower.
Tallahatchie.
Tate.
Tippah.
Tishomingo.
Tunica.
Union.
Warren.
Washington
Wayne.
Webster.
Wilkinson.
Winston.
Yalobusha.
Yazoo.

MISSOURI.

Adair.
Andrew.
Atchison.
Audrain.
Barry.
Barton.
Bates.
Benton.
Bollinger.
Boone.
Buchanan.
Butler.
Caldwell.
Callaway.
Camden.
Cape Girardeau.
Carroll.
Carter.
Cass.
Cedar.
Chariton.
Christian.
Clark.
Clay.
Clinton.
Cole.
Cooper.
Crawford.
Dade.
Dallas.
Daviess.
Dekalb.
Dent.
Douglas.
Dunklin.
Franklin.
Gasconade.
Gentry.
Greene.
Grundy.
Harrison.
Henry.
Hickory.
Holt.
Howard.
Howell.
Iron.
Jackson.
Jasper.
Jefferson.
Johnson.
Knox.
Laclede.
Lafayette.
Lawrence.
Lewis.
Lincoln.
Linn.
Livingston.
McDonald.
Macon.
Madison.
Maries.
Marion.
Mercer.
Miller.
Mississippi.
Moniteau.
Monroe.
Montgomery.
Morgan.
New Madrid.
Newton.
Nodaway
Oregon.
Osage.
Ozark.
Pemiscot.
Perry.
Pettis.
Phelps.
Pike.
Platte.
Polk.
Pulaski.
Putnam.
Ralls.
Randolph.
Ray.
Reynolds.
Ripley.
St. Charles.
St. Clair.
Ste. Genevieve.
St. François.
St. Louis.
St. Louis City.
Saline.
Schuyler.
Scotland.
Scott.
Shannon.
Shelby.
Stoddard.
Stone.
Sullivan.
Taney.
Texas.
Vernon.
Warren.
Washington.
Wayne.
Webster.
Worth.
Wright.

MONTANA.

Beaverhead.
Cascade.
Choteau.
Custer.
Dawson.
Deerlodge.
Fergus.
Gallatin.
Jefferson.
Lewis and Clarke.
Madison.
Meagher.
Missoula.
Park.
Silverbow.
Yellowstone.

NEBRASKA.

Adams.
Antelope.
Arthur.
Banner.
Blaine.
Boone.
Boxbutte.
Brown.
Buffalo.
Burt.
Butler.
Cass.
Cedar.
Chase.
Cherry.
Cheyenne.
Clay.
Colfax.
Cuming.
Custer.
Dakota.
Dawes.
Dawson.
Deuel.
Dixon.
Dodge.
Douglas.
Dundy.

Fillmore.
Franklin.
Frontier.
Furnas.
Gage.
Garfield.
Gosper.
Grant.
Greeley.
Hall.
Hamilton.
Harlan.
Hayes.
Hitchcock.
Holt.
Hooker.
Howard.
Jefferson.
Johnson.
Kearney.
Keith.
Keyapaha.
Kimball.
Knox.
Lancaster.
Lincoln.
Logan.
Loup.
McPherson.
Madison.
Merrick.
Nance.
Nemaha.
Nuckolls.
Otoe.
Pawnee.
Perkins.
Phelps.
Pierce.
Platte.
Polk.
Redwillow.
Richardson.
Rock.
Saline.
Sarpy.
Saunders.
Scotts Bluff.
Seward.
Sheridan.
Sherman.
Sioux.
Stanton.
Thayer.
Thomas.
Thurston.
Valley.
Washington.
Wayne.
Webster.
Wheeler.
York.

NEVADA.

Churchill.
Douglas.
Elko.
Esmeralda.
Eureka.
Humboldt.
Lander.
Lincoln.
Lyon.
Nye.
Ormsby.
Storey.
Washoe.
White Pine.

NEW HAMPSHIRE.

Belknap.
Carroll.
Cheshire.
Coos.
Grafton.
Hillsboro.
Merrimack.
Rockingham.
Strafford.
Sullivan.

NEW JERSEY.

Atlantic.
Bergen.
Burlington.
Camden.
Cape May.
Cumberland.
Essex.
Gloucester.
Hudson.
Hunterdon.
Mercer.
Middlesex.
Monmouth.
Morris.
Ocean.
Passaic.
Salem.
Somerset.
Sussex.
Union.
Warren.

NEW MEXICO.

Bernalillo.
Chaves.
Colfax.
Donna Ana.
Eddy.
Grant.
Lincoln.
Mora.
Rio Arriba.
San Juan.
San Miguel.
Santa Fe.
Sierra.
Socorro.
Taos.
Valencia.

NEW YORK.

Albany.
Allegany.
Broome.
Cattaraugus.
Cayuga.
Chautauqua.
Chemung.
Chenango.
Clinton.
Columbia.
Cortland.
Delaware.
Dutchess.
Erie.
Essex.
Franklin.
Fulton.
Genesee.
Greene.
Hamilton.
Herkimer.
Jefferson.
Kings.
Lewis.
Livingston.
Madison.
Monroe.
Montgomery.
New York.
Niagara.
Oneida.
Onondaga.
Ontario.
Orange.
Orleans.
Oswego.
Otsego.
Putnam.
Queens.
Rensselaer.
Richmond.
Rockland.
St. Lawrence.
Saratoga.
Schenectady.
Schoharie.
Schuyler.
Seneca.
Steuben.
Suffolk.
Sullivan.
Tioga.
Tompkins.
Ulster.
Warren.
Washington.
Wayne.
Westchester.
Wyoming.
Yates.

NORTH CAROLINA.

Alamance.
Alexander.
Alleghany.
Anson.
Ashe.
Beaufort.
Bertie.
Bladen.
Brunswick.
Buncombe.
Burke.
Cabarrus.
Caldwell.
Camden.
Carteret.
Caswell.
Catawba.
Chatham.
Cherokee.
Chowan.
Clay.
Cleveland.
Columbus.
Craven.
Cumberland.
Currituck.
Dare.
Davidson.
Davie.
Duplin.
Durham.
Edgecombe
Forsyth.
Franklin.
Gaston.
Gates.
Graham.
Granville.
Greene.
Guilford
Halifax.
Harnett.
Haywood.
Henderson.
Hertford.
Hyde.
Iredell.
Jackson.
Johnston.
Jones.
Lenoir.
Lincoln.
McDowell.
Macon.
Madison.
Martin.
Mecklenburg.
Mitchell.
Montgomery.
Moore.
Nash.
New Hanover.
Northampton.
Onslow.
Orange.
Pamlico.
Pasquotank.
Pender.
Perquimans.
Person.
Pitt.
Polk.
Randolph.
Richmond.
Robeson.
Rockingham.
Rowan.
Rutherford.
Sampson.
Stanly.
Stokes.
Surry.
Swain.
Transylvania.
Tyrrell.
Union.
Vance.
Wake.
Warren.
Washington.
Watauga.
Wayne.
Wilkes.
Wilson.
Yadkin.
Yancey.

NORTH DAKOTA

Alred.
Barnes.
Benson.
Billings.
Bottineau.
Bowman.
Buford.
Burleigh.
Cass.
Cavalier.
Church.
Dickey.
Dunn.
Eddy.
Emmons.
Flannery.
Foster.
Garfield.
Grand Forks.
Griggs.
Hettinger.
Kidder.
Lamoure.
Logan.
McHenry.
McIntosh.
McKenzie.
McLean.
Mercer.
Morton.
Mountraille.
Nelson.
Oliver.
Pembina.
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Lucas.
Madison.
Mahoning.
Marion.
Medina.
Meigs.
Mercer.
Miami.
Monroe.
Montgomery.
Morgan.
Morrow.
Muskingum.
Noble.
Ottawa.
Paulding.
Perry.
Pickaway.
Pike.
Portage.
Preble.
Putnam.
Richland.
Ross.
Sandusky.
Scioto.
Seneca.
Shelby.
Stark.
Summit.
Trumbull.
Tuscarawas.
Union.
Van Wert.
Vinton.
Warren.
Washington.
Wayne.
Williams.
Wood.
Wyandot.

OKLAHOMA.

Beaver.
Canadian.
Cleveland.
Kingfisher.
Logan.
Oklahoma.
Payne.

OREGON.

Baker.
Benton.
Clackamas.
Clatsop.
Columbia.
Coos.
Crook.
Curry.
Douglas.
Gilliam.
Grant.
Harney.
Jackson.
Josephine.
Klamath.
Lake.
Lane.
Linn.
Malheur.
Marion.
Morrow.
Multnomah.
Polk.
Sherman.
Tillamook.
Umatilla.
Union.
Wallowa.
Wasco.
Washington.
Yamhill.

PENNSYLVANIA.

Adams.
Allegheny.
Armstrong.
Beaver.
Bedford.
Berks.
Blair.
Bradford.
Bucks.
Butler.
Cambria.
Cameron.
Carbon.
Center.
Chester.
Clarion.
Clearfield.
Clinton.
Columbia.
Crawford.
Cumberland.
Dauphin.
Delaware.
Elk.
Erie.
Fayette.
Forest.
Franklin.
Fulton.
Greene.
Huntingdon.
Indiana.
Jefferson.
Juniata.
Lackawanna.
Lancaster.
Lawrence.
Lebanon.
Lehigh.
Luzerne.
Lycoming.
McKean.
Mercer.
Mifflin.
Monroe.
Montgomery.
Montour.
Northampton.
Northumberland.
Perry.
Philadelphia.
Pike.
Potter.
Schuylkill.
Snyder.
Somerset.
Sullivan.
Susquehanna.
Tioga.
Union.
Venango.
Warren.
Washington.
Wayne.
Westmoreland.
Wyoming.
York.

RHODE ISLAND.

Bristol.
Kent.
Newport.
Providence.
Washington.

SOUTH CAROLINA.

Abbeville.
Aiken.
Anderson.
Barnwell.
Beaufort.
Berkeley.
Charleston.
Chester.
Chesterfield.
Clarendon.
Colleton.
Darlington.
Edgefield.
Fairfield.
Florence.
Georgetown
Greenville.
Hampton.
Horry.
Kershaw.
Lancaster.
Laurens.
Lexington.
Marion.
Marlboro.
Newberry.
Oconee.
Orangeburg.
Pickens.
Richland.
Spartanburg.
Sumter.
Union.
Williamsburg.
York.

SOUTH DAKOTA.

Aurora.
Beadle.
Bonhomme.
Boreman.
Brookings.
Brown.
Brule.
Buffalo.
Butte.
Campbell.
Charles Mix.
Chotean.
Clark.
Clay.
Codington.
Custer.
Davison.
Day.
Delano.
Deuel.
Dewey.
Douglas.
Edmunds.
Ewing.
Fall River.
Faulk.
Grant.
Gregory.
Hamlin.
Hand.
Hanson.
Harding.
Hughes.
Hutchinson.
Hyde.
Jackson.
Jerauld.
Kingsbury.
Lake.
Lawrence.
Lincoln.
Lugenbeel.
Lyman.
McCook.
McPherson.
Marshall.
Martin.
Meade.
Meyer.
Miner.
Minnehaha.
Moody.
Nowlin.
Pennington.
Potter.
Pratt.
Presho.
Pyatt.
Rinehart.
Roberts.
Sanborn.
Schnasse.
Scobey.
Shannon.
Spink.

Stanley.
Sterling.
Sully.
Todd.
Tripp.
Turner.
Union.
Wagner.
Walworth.
Washabaugh.
Washington.
Yankton.
Ziebach.

TENNESSEE.

Anderson.
Bedford.
Benton.
Bledsoe.
Blount.
Bradley.
Campbell.
Cannon.
Carroll.
Carter.
Cheatham.
Chester.
Claiborne.
Clay.
Cocke.
Coffee.
Crockett.
Cumberland.
Davidson.
Decatur.
Dekalb.
Dickson.
Dyer.
Fayette.
Fentress.
Franklin.
Gibson.
Giles.
Grainger.
Greene.
Grundy.
Hamblen.
Hamilton.
Hancock.
Hardeman.
Hardin.
Hawkins.
Haywood.
Henderson.
Henry.
Hickman.
Houston.
Humphreys.
Jackson.
James.
Jefferson.
Johnson.
Knox.
Lake.
Lauderdale.
Lawrence.
Lewis.
Lincoln.
Loudon.
McMinn.
McNairy.
Macon.
Madison.
Marion.
Marshall.
Maury.
Meigs.
Monroe.
Montgomery.
Moore.
Morgan.
Obion.
Overton.
Perry.
Pickett.
Polk.
Putnam.
Rhea.
Roane.
Robertson.
Rutherford.
Scott.
Sequatchie.
Sevier.
Shelby.
Smith.
Stewart.
Sullivan.
Sumner.
Tipton.
Trousdale.
Unicoi.
Union.
Van Buren.
Warren.
Washington.
Wayne.
Weakley.
White.
Williamson.
Wilson.

TEXAS.

Anderson.
Andrews.
Angelina.
Aransas.
Archer.
Armstrong.
Atascosa.
Austin.
Bailey.
Bandera.
Bastrop.
Baylor.
Bee.
Bell.
Bexar.
Blanco.
Borden.
Bosque.
Bowie.
Brazoria.
Brazos.
Brewster.
Briscoe.
Brown.
Buchel.
Burleson.
Burnet.
Caldwell
Calhoun.
Callahan.
Cameron.
Camp.
Carson.
Cass.
Castro.
Chambers.
Cherokee.
Childress.
Clay.
Cochran.
Coke.
Coleman.
Collin.
Collingsworth.
Colorado.
Comal.
Comanche.
Concho.
Cooke.
Coryell.
Cottle.
Crane.
Crockett.
Crosby.
Dallam.
Dallas.
Dawson.
Deaf Smith.
Delta.
Denton.
Dewitt.
Dickens.
Dimmit.
Donley.
Duval.
Eastland.
Ector.
Edwards.
Ellis.
El Paso.
Encinal.
Erath.
Falls.
Fannin.
Fayette.
Fisher.
Floyd.
Foley.
Fort Bend.
Franklin.
Freestone.
Frio.
Gaines.
Galveston.
Garza.
Gillespie.
Glasscock.
Goliad.
Gonzales.
Gray.
Grayson.
Gregg.
Grimes.
Guadalupe.
Hale.
Hall.
Hamilton.
Hansford.
Hardeman.
Hardin.
Harris.
Harrison.
Hartley.
Haskell.
Hays.
Hemphill.
Henderson.
Hidalgo.
Hill.
Hockley.
Hood.
Hopkins.
Houston.
Howard.
Hunt.
Hutchinson.
Irion.
Jack.
Jackson.
Jasper.
Jeff Davis.
Jefferson.
Johnson.
Jones.
Karnes.
Kaufman.
Kendall.
Kent.
Kerr.
Kimble.
King.
Kinney.
Knox.
Lamar.
Lamb.
Lampasas.
Lasalle.
Lavaca.
Lee.
Leon.
Liberty.
Limestone.
Lipscomb.
Live Oak.
Llano.
Loving.
Lubbock.
Lynn.
McCulloch.
McLennan.
McMullen.
Madison.
Marion.
Martin.
Mason.
Matagorda.
Maverick.
Medina.
Menard.
Midland.
Milam.
Mills.
Mitchell.
Montague.
Montgomery.
Moore.
Morris.
Motley.
Nacogdoches.
Navarro.
Newton.
Nolan.
Nueces.
Ochiltree.
Oldham.
Orange.
Palo Pinto.
Panola.
Parker.
Parmer.
Pecos.
Polk.
Potter.
Presidio.
Rains.
Randall.
Red River.
Reeves.
Refugio.
Roberts.
Robertson.
Rockwall.
Runnels.
Rusk.
Sabine.
San Augustine.
San Jacinto.
San Patricio.
San Saba.
Schleicher.
Scurry.
Shackelford.
Shelby.
Sherman.
Smith.
Somervell.
Starr.
Stephens.
Stonewall.
Sutton.
Swisher.
Tarrant.
Taylor.
Terry.
Throckmorton.
Titus.

Lamoille.
Orange.
Orleans.
Rutland.
Washington.
Windham.
Windsor.

VIRGINIA.

Accomac.
Albemarle.
Alexandria.
Alleghany.
Amelia.
Amherst.
Appomattox.
Augusta.
Bath.
Bedford.
Bland.
Botetourt.
Brunswick.
Buchanan.
Buckingham.
Campbell.
Caroline.
Carroll.
Charles City.
Charlotte.
Chesterfield.
Clarke.
Craig.
Culpeper.
Cumberland.
Dickenson.
Dinwiddie.
Elizabeth City.
Essex.
Fairfax.
Fauquier.
Floyd.
Fluvanna.
Franklin.
Frederick.
Giles.
Gloucester.
Goochland.
Grayson.
Greene.
Greenesville.
Halifax.
Hanover.
Henrico.
Henry.
Highland.
Isle of Wight.
James City.
King and Queen.
King George.
King William.
Lancaster.
Lee.
Loudoun.
Louisa.
Lunenburg.
Madison.
Mathews.
Mecklenburg.
Middlesex.
Montgomery.
Nansemond.
Nelson.
New Kent.
Norfolk.
Northampton.
Northumberland.
Nottoway.
Orange.
Page.
Patrick.
Pittsylvania.
Powhatan.
Prince Edward.
Prince George.
Princess Anne.
Prince William.
Pulaski.
Rappahannock.
Richmond.
Roanoke.
Rockbridge.
Rockingham.
Russell.
Scott.
Shenandoah.
Smyth.
Southampton.
Spottsylvania.
Stafford.
Surry.
Sussex.
Tazewell.
Warren.
Warwick.
Washington.
Westmoreland.
Wise.
Wythe.
York.

WASHINGTON.

Adams.
Asotin.
Chehalis.
Clallam.
Clarke.
Columbia.
Cowlitz.
Douglas.
Franklin.
Garfield.
Island.
Jefferson.
King.
Kitsap.
Kittitas.
Klickitat.
Lewis.
Lincoln.
Mason.
Okanogan.
Pacific.
Pierce.
San Juan.
Skagit.
Skamania.
Snohomish.
Spokane.
Stevens.
Thurston.
Wahkiakum.
Wallawalla.
Whatcom.
Whitman.
Yakima.

WEST VIRGINIA.

Barbour.
Berkeley.
Boone.
Braxton.
Brooke.
Cabell.
Calhoun.
Clay.
Doddridge.
Fayette.
Gilmer.
Grant.
Greenbrier.
Hampshire.
Hancock.
Hardy.
Harrison.
Jackson.
Jefferson.
Kanawha.
Lewis.
Lincoln.
Logan.
McDowell.
Marion.
Marshall.
Mason.
Mercer.
Mineral.
Monongalia.
Monroe.
Morgan.
Nicholas.
Ohio.
Pendleton.
Pleasants.
Pocahontas.
Preston.
Putnam.
Raleigh.
Randolph.
Ritchie.
Roane.
Summers.
Taylor.
Tucker.
Tyler.
Upshur.
Wayne.
Webster.
Wetzel.
Wirt.
Wood.
Wyoming.

WISCONSIN.

Adams.
Ashland.
Barron.
Bayfield.
Brown.
Buffalo.
Burnett.
Calumet.
Chippewa.
Clark.
Columbia.
Crawford.
Dane.
Dodge.
Door.
Douglas.
Dunn.
Eauclaire.
Florence.
Fond du Lac.
Forest.
Grant.
Green.
Green Lake.
Iowa.
Jackson.
Jefferson.
Juneau.
Kenosha.
Kewaunee.
Lacrosse.
Lafayette.
Langlade.
Lincoln.
Manitowoc.
Marathon.
Marinette.
Marquette.
Milwaukee.
Monroe.
Oconto.
Oneida.
Outagamie.
Ozaukee.
Pepin.
Pierce.
Polk.
Portage.
Price.
Racine.
Richland.
Rock.
St. Croix.

Sauk.	Vernon.	Waushara.	Bighorn.	Laramie.
Sawyer.	Walworth.	Winnebago.	Carbon.	Natrona.
Shawano.	Washburn.	Wood.	Converse.	Sheridan.
Sheboygan.	Washington.		Crook.	Sweetwater.
Taylor.	Waukesha.	WYOMING.	Fremont.	Uinta.
Trempealeau.	Waupaca.	Albany.	Johnson.	Weston.

O

52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { EX. DOC. No. 17.

CLERKS AND OTHER PERSONS EMPLOYED IN THE WAR DEPARTMENT.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING

A list of the clerks and other persons employed in the War Department from December 1, 1890, to November 30, 1891, with a statement of the sums paid to each.

JANUARY 5, 1892.—Referred to the Committee on Expenditures in the War Department and ordered to be printed.

WAR DEPARTMENT,
Washington, December 21, 1891.

SIR: I have the honor to transmit herewith, in compliance with section 194 of the Revised Statutes, lists of the clerks and other persons employed in the War Department, its bureaus and offices, from December 1, 1890, to November 30, 1891, with the sums paid to each, together with the lists of the employés in the Signal Office from July 1, 1891, to November 30, 1891; that office having been reorganized on July 1, 1891, under the provisions of the act of October 1, 1890 (26 Stats., p. 653).

With reference to so much of section 194 as requires the head of each Department to state whether the clerks and other persons "have been usefully employed; whether the services of any of them can be dispensed with without detriment to the public service, and whether the removal of any individuals and the appointment of others in their stead is required for the better dispatch of businesss," attention is invited to the note on page 41, Book of Estimates, for the fiscal year ending June 30, 1893 (House Ex. Doc., No. 5, Fifty-second Congress, first session), showing the number of employés of the Department and its bureaus who are deemed below a fair standard of efficiency, this report having been transmitted, by letter dated November 13 last, from this Department to the Secretary of the Treasury, with the annual estimates for the fiscal year ending June 30, 1893, as required by section 2 of the act approved July 11, 1890 (26 Stats., p. 268).

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

Statement showing the names, compensation, etc., of clerks, messengers, assista messengers, watchmen, and laborers employed in the office of the Secretary of Wa from December 1, 1890, to November 30, 1891.

No.	Names.	Annual salary.	Period of service.		Amount received.	Residence whe appointed.
			From—	To—		
	CLASS 5.					
	Chief Clerk.					
1	John Tweedale	$2,750	Dec. 1, 1890	Nov. 30, 1891	$2,750.00	Pennsylvania.
	Disbursing clerk.					
2	Wm. S. Yeatman	2,000	Dec. 1, 1890	Nov. 30, 1891	2,000.00	Dist. of Columl
	Chiefs of Division.					
3	Saml. Hodgkins	2,000	Dec. 1, 1890	Nov. 30, 1891	2,000.00	Army.
4	Jno. B. Randolph	2,000	....do	....do	2,000.00	Dist. of Columl
5	Saml. D. Miller[1]	2,000	Apr. 24, 1891	....do	1,205.16	Indiana.
	CLASS 4.					
	Stenographers.					
6	C. H. Carrington	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	Ohio.
7	B. W. Hanna	1,800	....do	....do	1,800.00	Kansas.
	Clerks.					
8	James A. Randall	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	New York.
9	Sydney E. Smith	1,800	....do	....do	1,800.00	Dist. of Columl
10	David FitzGerald	1,800	....do	....do	1,800.00	Iowa.
11	M. R. Thorp	1,800	....do	....do	1,800.00	Ohio.
12	C. B. Tanner	1,800	....do	....do	1,800.00	Pennsylvania.
	CLASS 3.					
13	B. F. Wilkins	1,600	Dec. 1, 1890	Nov. 30, 1891	1,600.00	Vermont.
14	R. Duryee	1,600	....do	....do	1,600.00	Connecticut.
15	John C. Scofield	1,600	....do	....do	1,600.00	Georgia.
16	A. N. Thompson	1,600	....do	....do	1,600.00	Dist. of Columl
17	James C. Churchill	1,600	....do	....do	1,600.00	New Mexico.
	CLASS 2.					
18	Chas. R. Fosdick	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	Ohio.
19	Francis W. Edwards	1,400	....do	....do	1,400.00	Massachusetts.
20	J. P. Hodges	1,400	....do	....do	1,400.00	Iowa.
21	Thos. M. Reed	1,400	....do	....do	1,400.00	New Jersey.
22	H. C. Rutter	1,400	....do	....do	1,400.00	Ohio.
23	Wm. R. Hillyer	1,400	....do	....do	1,400.00	Florida.
24	Alex. L. Robinson[2]	1,400	....do	Apr. 29, 1891	463.97	New York.
25	F. W. Ford	1,400	....do	Nov. 30, 1891	1,400.00	Dist. of Columl
26	Joseph S. Moss	1,400	....do	....do	1,400.00	Vermont.
27	D. E. Sharretts[3]	[4]1,200	....do	May 17, 1891	556.04	Pennsylvania.
		1,400	May 18, 1891	Nov. 30, 1891	751.35	
					1,307.39	
	CLASS 1.					
28	Martin P. King	1,200	Dec. 1, 1890	Nov. 30, 1890	1,200.00	Dist. of Columl
29	Edward Dunn	1,200	....do	....do	1,200.00	Ohio.
30	Daniel A. Whitesell	1,200	....do	....do	1,200.00	Pennsylvania.
31	Maurice Pechin	1,200	....do	....do	1,200.00	Dist. of Columl
32	Sam'l B. Loving	1,200	....do	....do	1,200.00	Virginia.
33	G. C. Thomas	1,200	....do	....do	1,200.00	Dist. of Columl
34	Samuel Snow	1,200	....do	....do	1,200.00	Connecticut.
35	A. D. Wilcox	1,200	....do	....do	1,200.00	Pennsylvania.
36	F. B. Bourn[5]	1,200	....do	....do	1,098.90	Rhode Island.
37	Wm. M. Ash	1,200	....do	....do	1,200.00	Pennsylvania.
38	Fr. Ruenzler	1,200	....do	....do	1,200.00	Do.
39	George R. McManus	1,200	....do	....do	1,200.00	Wisconsin.
40	Della P. Woodruff	1,200	....do	....do	1,200.00	Illinois.
41	N. H. Stevens	1,200	....do	....do	1,200.00	New York.
42	E. V. Brown[6]	1,200	....do	June 17, 1891	658.24	Georgia.
43	J. C. Grant	1,200	....do	Nov. 30, 1891	1,200.00	Minnesota.
44	A. B. Legare[6]	1,200	....do	July 31, 1891	802.20	South Carolina
45	Julia F. Randolph	1,200	....do	Nov. 30, 1891	1,200.00	New Jersey.

[1] Appointed.
[2] Resigned; absent 30 days without pay.
[3] Promoted.
[4] Clerk class 1.
[5] Absent 31 days without pay.
[6] Resigned.

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS 1—Continued.					
16	G. H. Taggard	$1,200	Dec. 1, 1890	Nov. 30, 1890	$1,200.00	New Hampshire.
17	Ed. G. Randall	1,200	....do	....do	1,200.00	Pennsylvania.
18	A. W. Hodgkins[1]	1,200	May 23, 1891	Aug. 17, 1891	285.10	Dist. of Columbia.
19	Robert E. Parker[2]	1,200	June 24, 1891	Nov. 30, 1891	521.98	California.
20	C. Bankes Brookes[4]	$1,000	May 23, 1891	Aug. 5, 1891	204.92	New York.
		1,200	Aug. 6, 1891	Nov. 30, 1871	381.48	
					586.40	
	CLASS E.					
	Clerks Class $1,000.					
21	Wm. B. Lee	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Massachusetts.
22	Louis Koerth	1,000	....do	....do	1,000.00	Army.
23	W. C. Taylor	1,000	....do	....do	1,000.00	Virginia.
24	George K. Jenvey	1,000	....do	....do	1,000.00	Ohio.
25	Wm. F. Field[5]	1,000	....do	Aug. 2, 1891	673.83	Indiana.
26	Samuel Dickson	1,000	....do	Nov. 30, 1891	1,000.00	Virginia.
27	Wm. C. Carroll[6]	1,000	Dec. 11, 1890	Apr. 23, 1801	370.26	Illinois.
28	David O. Floyd[7]	1,000	Aug. 11, 1890	Nov. 30, 1891	304.47	Massachusetts.
29	Edw. A. Gay[7]	1,000	Sept. 23, 1891	....do	173.95	New Jersey.
	Carpenter.					
30	A. R. Johnson	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Virginia.
	Foreman of Laborers.					
31	W. M. Johnson[8]	1,000	Dec. 1, 1890	Nov. 3, 1891	926.55	Dist. of Columbia
	Messengers.					
32	J. H. Stewart	840	Dec. 1, 1890	Nov. 30, 1891	840.00	Maryland.
33	A. Brooks	840	....do	....do	840.00	Virginia.
34	Edward Quade	840	....do	....do	840.00	Dist. of Columbia.
35	Henry D. Burwell	840	....do	....do	840.00	Virginia.
	Assistant messengers.					
36	Geo. W. Graves	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Dist. of Columbia.
37	Horatio N. Smith	720	....do	....do	720.00	Massachusetts.
38	Joseph C. Higgs	720	....do	....do	720.00	Pennsylvania.
39	A. M. Howard	720	....do	....do	720.00	Dist. of Columbia
70	A. W. Bogia	720	....do	....do	720.00	Delaware.
71	Thomas Withers	720	....do	....do	720.00	Georgia.
72	James W. Loveless[9]	$660	Dec. 1, 1890	Jan. 8, 1891	70.27	Dist. of Columbia.
		720	Jan. 9, 1891	Nov. 30, 1891	643.40	
					713.67	
	Laborers.					
73	E. Stannard	660	Dec. 1, 1890	Nov. 30, 1891	660.00	Dist. of Columbia.
74	H. C. James[10]	660	....do	May 12, 1891	296.76	Do.
75	Chas. McEntyre	660	....do	Nov. 30, 1891	660.00	Ohio.
76	C. A. Payton[11]	660	....do	Sept. 3, 1891	502.18	Virginia.
77	Wm. Crompton	660	....do	Nov. 30, 1891	660.00	Dist. of Columbia.
78	Sam'l H. Brown	660	....do	....do	660.00	Do.
79	Daniel E. Barrett[13]	660	....do	....do	645.66	Vermont.
80	B. J. Edwards[9]	[12]540	....do	Jan. 8, 1891	57.50	North Carolina.
		660	Jan. 9, 1891	Nov. 30, 1891	589.77	
					647.27	
81	Charles E. Beebe[14]	[12]540	Feb. 7, 1891	May 12, 1891	141.80	Michigan.
		660	May 13, 1891	Nov. 30, 1891	363.25	
					505.05	
82	W. R. Lee[7]	660	Sept. 5, 1891	....do	156.03	Louisiana.

[1] Appointed May 23, 1891; transferred to Quartermaster-General's Office Aug. 18, 1891.
[2] Transferred from Record and Pension Division.
[3] Clerk class $1,000.
[4] Appointed May 23, 1891; promoted Aug 6, 1891.
[5] Resigned.
[6] Appointed Dec. 11 1890; resigned Apr. 23, 1891.
[7] Appointed.
[8] Laborer.
[9] Promoted.
[10] Transferred to record and pension division May 13, 1891.
[11] Transferred to Office Surgeon-General Sept. 4, 1891.
[12] Absent 8 days without pay.
[13] Watchman.
[14] Apppointed Feb. 7. Promoted May 13, 1891.

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS E—Continued.					
	Hostlers.					
83	Thos. S. Anderson	$600	Dec. 1, 1890	Nov. 60, 1891	$600.00	Dist. of Columbia.
84	John H. Wilson	540	....do	....do	540.00	Maryland.
85	John W. Thompson	540	....do	....do	540.00	New York.
	Watchmen.					
86	Wm. Budd[1]	540	May 19, 1891	Oct. 31, 1891	244.29	Maryland.
87	J. W. Harwood[2]	540	Nov. 17, 1891	Nov. 30, 1891	20.54	Vermont.
	Clerk Class 3 for the retired General of the Army.					
88	James M. Barrett[3]	1,600	Dec. 1, 1890	Mar. 11, 1891	445.89	New York.

Statement showing the names, compensation, etc., of clerks, messengers, assistant messengers, watchmen, and laborers employed in the record and pension division, War Department, from December 1, 1890, to November 30, 1891.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	Chiefs of Division.					
1	O. B. Brown	$2,000	Dec. 1, 1890	Nov. 30, 1891	$2,000.00	Iowa.
2	Jacob Frech	2,000	....do	....do	2,000.00	Dist. of Columbia.
	CLASS 4.					
3	G. E. Corson	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	Maine.
4	J. J. Dermody	1,800	....do	....do	1,800.00	Dist. of Columbia.
5	James H. Dodge	1,800	....do	....do	1,800.00	Maryland.
6	H. Douglas	1,800	....do	....do	1,800.00	Dist. of Columbia.
7	G. W. Fisher	1,800	....do	....do	1,800.00	Pennsylvania.
8	Eugene Gaither	1,800	....do	....do	1,800.00	Dist. of Columbia.
9	Wm. E. Harley	1,800	....do	....do	1,800.00	Pennsylvania.
10	John C. Hesse	1,800	....do	....do	1,800.00	Dist. of Columbia.
11	J. R. Imbrie	1,800	....do	....do	1,800.00	Pennsylvania.
12	Jos. S. McCoy	1,800	....do	....do	1,800.00	New York.
13	Thomas L. Miller	1,800	....do	....do	1,800.00	Massachusetts.
14	Wm. G. Powers	1,800	....do	....do	1,800.00	Do.
15	George W. Pratt	1,800	....do	....do	1,800.00	Maine.
16	G. W. Salter	1,800	....do	....do	1,800.00	New York.
17	Ernst Schmid	1,800	....do	....do	1,800.00	Army.
18	L. W. Slater	1,800	....do	....do	1,800.00	Virginia.
19	Alva R. Tichenor	1,800	....do	....do	1,800.00	Ohio.
20	J. W. Webb	1,800	....do	....do	1,800.00	New York.
21	E A. Woodward	1,800	....do	....do	1,800.00	Do.
22	A. G. Yount	1,800	....do	....do	1,800.00	Pennsylvania.
	CLASS 3.					
23	Chas. R. Barker	1,600	Dec. 1, 1890	Nov. 30, 1891	1,600.00	Massachusetts.
24	Stephen Bates	1,600	....do	....do	1,600.00	Do.
25	B. W. Browne[4]	1,600	....do	....do	1,343.48	Florida.
26	Z. S. Buckler	1,600	....do	....do	1,600.00	Maryland.
27	John F. Cash	1,600	....do	....do	1,600.00	New York.
28	E. G. Chapman	1,600	....do	....do	1,600.00	Do.
29	B. F. Cole	1,600	....do	....do	1,600.00	Do.
30	W. E. Covert	1,600	....do	....do	1,600.00	Kentucky.
31	David Currier	1,600	....do	....do	1,600.00	New Hampshire.
32	Chas. W. Egan	1,600	....do	....do	1,600.00	Texas.
33	F. Eichelberger	1,600	....do	....do	1,600.00	Kansas.
34	S. B. Evans	1,000	....do	....do	1,600.00	Dist. of Columbia.
35	Jas. L. Falbey	1,600	....do	....do	1,600.00	Pennsylvania.
36	E. A. Fenton	1,600	....do	....do	1,600.00	New York.
37	J. C. Fill	1,600	....do	....do	1,600.00	Dist. of Columbia.
38	F. J. Foster	1,600	....do	....do	1,600.00	New York.
39	J. F. Gibson	1,600	....do	....do	1,600.00	Ohio.

[1] Appointed May 19. Resigned Oct. 31, 1891.
[2] Appointed.
[3] Resigned.
[4] Absent 59 days without pay.

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Annual salary.	Period of service. From—	To—	Amount received.	Residence when appointed.
	CLASS 3—Continued.					
40	James R. Gibson	$1,600	Dec. 1, 1890	Nov. 30, 1891	$1,600.00	Missouri.
41	Wm. Gleason	1,600	....do	....do	1,600.00	Do.
42	F. J. Gramlich	1,600	....do	....do	1,600.00	Maryland.
43	J. M. Harmon[1]	1,600	....do	....do	1,593.59	Massachusetts.
44	F. C. Holland	1,600	....do	....do	1,600.00	Pennsylvania.
45	J. H. Jochum	1,600	....do	....do	1,600.00	New York.
46	Jno. M. Keogh	1,600	....do	....do	1,600.00	Do.
47	Wm. M. Lay	1,600	....do	....do	1,600.00	Maryland.
48	Jno. D. Leonard	1,600	....do	....do	1,600.00	Dist. of Columbia.
49	E. S. McCleary	1,600	....do	....do	1,600.00	Pennsylvania.
50	E. K. McKeever	1,600	....do	....do	1,600.00	Do.
51	Chas. P. Miller, jr	1,600	....do	....do	1,600.00	Do.
52	F. B. Miller	1,600	....do	....do	1,600.00	Do.
53	Jos. S. Miller	1,600	....do	....do	1,600.00	Do.
54	A. M. Muzzy	1,600	....do	....do	1,600.00	Dist. of Columbia.
55	John O'Neill	1,600	....do	....do	1,600.00	Do.
56	C. Parkinson	1,600	....do	....do	1,600.00	Texas.
57	R. M. Patrick	1,600	....do	....do	1,600.00	New York.
58	L. M. Penfield	1,600	....do	....do	1,600.00	Connecticut.
59	A. Rechenberg	1,600	....do	....do	1,600.00	Army.
60	Charles Shelsé	1,600	....do	....do	1,600.00	Dist. of Columbia.
61	W. F. Snyder	1,600	....do	....do	1,600.00	Do.
62	E. H. Spang	1,600	....do	....do	1,600.00	Pennsylvania.
63	James P. Townsend[2]	1,600	....do	....do	1,541.32	Massachusetts.
64	G. W. Walden	1,600	....do	....do	1,600.00	Maryland.
65	Wilmer W. Wetzel	1,600	....do	....do	1,600.00	Dist. of Columbia.
	CLASS 2.					
66	Alex. Abraham	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	Alabama.
67	Geo. Q. Allen	1,400	....do	....do	1,400.00	Pennsylvania.
68	L. P. Altschu	1,400	....do	....do	1,400.00	Kansas.
69	W. A. André	1,400	....do	....do	1,400.00	Dist. of Columbia.
70	G. W. Babcock	1,400	....do	....do	1,400.00	Virginia.
71	S. P. Banes[3]	1,400	....do	....do	1,398.03	Pennsylvania.
72	Everett S. Beall	1,400	....do	....do	1,400.00	Maryland.
73	E. H. Booth	1,400	....do	....do	1,400.00	Pennsylvania.
74	John E. Bristol	1,400	....do	....do	1,400.00	New York.
75	Geo. O. Brown	1,400	....do	....do	1,400.00	Massachusetts.
76	J. G. Brown	1,400	....do	....do	1,400.00	Dist. of Columbia.
77	Chas. D. Bulla	1,400	....do	....do	1,400.00	Missouri.
78	John Bussius	1,400	....do	....do	1,400.00	Dist. of Columbia.
79	W. Cadman	1,400	....do	....do	1,400.00	Do.
80	Thos. Campbell	1,400	....do	....do	1,400.00	South Carolina.
81	O. E. Caruana	1,400	....do	....do	1,400.00	New York.
82	Chas. C. Casey	1,400	....do	....do	1,400.00	Pennsylvania.
83	M. G. Chew	1,400	....do	....do	1,400.00	Mississippi.
84	Chas. E. Connor	1,400	....do	....do	1,400.00	New York.
85	W. A. Craig	1,400	....do	....do	1,400.00	Do.
86	John H. Cutter	1,400	....do	....do	1,400.00	Ohio.
87	R. G. Daniels	1,400	....do	....do	1,400.00	Minnesota.
88	A. A. Darrah	1,400	....do	....do	1,400.00	Rhode Island.
89	E. Y. Davidson	1,100	....do	....do	1,400.00	Virginia.
90	Geo. P. Davis	1,400	....do	....do	1,400.00	Louisiana.
91	Wm. W. Davis	1,400	....do	....do	1,400.00	Dist. of Columbia.
92	S. J. Dewey	1,400	....do	....do	1,400.00	New York.
93	James H. Dony	1,400	....do	....do	1,400.00	Nebraska.
94	Wm. C. Doores	1,400	....do	....do	1,400.00	Pennsylvania.
95	Wm. B. Douglass	1,400	....do	....do	1,400.00	Connecticut.
96	Geo. J. Drew	1,400	....do	....do	1,400.00	Kansas.
97	H. W. Durnall	1,400	....do	....do	1,400.00	Pennsylvania.
98	A. H. Elliott	1,400	....do	....do	1,400.00	Do.
99	Alexander Fairley	1,400	....ko	....do	1,400.00	Dist. of Columbia.
100	John Finn	1,400	....do	....do	1,400.00	Maryland.
101	R. W. Fish	1,400	....do	....do	1,400.00	Connecticut.
102	James Fishback	1,400	....do	....do	1,400.00	Illinois.
103	Wm. H. French[5]	$1,200	....do	Mar. 26, 1891	384.47	Virginia.
		1,400	Mar. 27, 1891	Nov. 30, 1891	951.54	
					1,336.01	
104	C. S. Hart	1,400	Dec. 1, 1890	....do	1,400.00	New Jersey.
105	Thos. E. Hatch	1,400	....do	....do	1,400.00	New Hampshire.
106	Rudolph Heinrichs	1,400	....do	....do	1,400.00	Dist. of Columbia.
107	W. H. Huston	1,400	....do	....do	1,400.00	Iowa.
108	H. A. Johnson	1,400	....do	....do	1,400.00	Pennsylvania.

[1] Absent 1½ days without pay.
[2] Absent 13½ days without pay.
[3] Absent ½ day without pay.
[4] Class 1.
[5] Promoted.

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continued

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS 2—Continued.					
109	J. Scott Johnson[2]	[1]$1,200 1,400	Dec. 1, 1890 Mar. 3, 1891	Mar. 2, 1891 Nov. 30, 1891	$304.47 1,044.88 1,349.35	Kentucky.
110	A. Kalstrom	1,400	Dec. 1, 1890	do	1,400.00	Illinois.
111	W. H. B. Kittson	1,400	do	do	1,400.00	New York.
112	Chas. A. Krause	1,400	do	do	1,400.00	Texas.
113	W. T. Leport	1,400	do	do	1,400.00	New Jersey.
114	James Loan	1,400	do	do	1,400.00	Pennsylvania.
115	E. K. Lundy	1,400	do	do	1,400.00	Do.
116	R. McDonald	1,400	do	do	1,400.00	New York.
117	W. S. Macgill	1,400	do	do	1,400.00	Maryland.
118	W. D. Mack	1,400	do	do	1,400.00	Michigan.
119	W. H. J. Malvin	1,400	do	do	1,400.00	Ohio.
120	John N. Manning	1,400	do	do	1,400.00	Do.
121	Jno. J. Meding	1,400	do	do	1,400.00	New York.
122	J. W. Moore	1,400	do	do	1,400.00	Pennsylvania.
123	James Moran	1,400	do	do	1,400.00	New York.
124	Jno. R. Neely	1,400	do	do	1,400.00	Illinois.
125	William E. Newman	1,400	do	do	1,400.00	Vermont.
126	John L. Owens	1,400	do	do	1,400.00	Dist. of Columb
127	J. S. Phelps	1,400	do	do	1,400.00	Vermont.
128	Frank Plunkett	1,400	do	do	1,400.00	Massachusetts.
129	H. C. Porter	1,400	do	do	1,400.00	New York.
130	Wm. M. Potter	1,400	do	do	1,400.00	Pennsylvania.
131	Fred. C. Pratz	1,400	do	do	1,400.00	Arizona.
132	Walter Procter	1,400	do	do	1,400.00	Navy.
133	J. F. Rapp	1,400	do	do	1,400.00	West Virginia.
134	J. L. Robertson	1,400	do	do	1,400.00	New Jersey.
135	B. R. Ross[3]	1,400	do	do	1,376.29	Dist. of Columb
136	Wm. A. Ruess	1,400	do	do	1,400.00	Ohio.
137	I. B. Ruff	1,400	do	do	1,400.00	Michigan.
138	Wm. Schreiber	1,400	do	do	1,400.00	Maryland.
139	Joseph S. F. Sessford	1,400	do	do	1,400.00	Dist. of Columb
140	Clarence F. Small	1,400	do	do	1,400.00	Ohio.
141	F. C. Squires	1,400	do	do	1,400.00	Michigan.
142	Jacob W. Starr[4]	1,400	do	do	1,398.03	New Jersey.
143	H. L. Street[5]	1,400	do	do	1,390.15	California.
144	David G. Struble	1,400	do	do	1,400.00	Michigan.
145	James Taylor	1,400	do	do	1,400.00	Maryland.
146	Abert Thomson	1,400	do	do	1,400.00	Florida.
147	B. D. Thomson	1,400	do	do	1,400.00	New Jersey.
148	S. E. Tracy	1,400	do	do	1,400.00	Texas.
149	D. B. Treadway	1,400	do	do	1,400.00	Kentucky.
150	Edward Turkenton	1,400	do	do	1,400.00	Dist. of Columb
151	M. Emmet Urell	1,400	do	do	1,400.00	New York.
152	T. H. Walsh	1,400	do	do	1,400.00	Do.
153	G. A. Whitcomb	1,400	do	do	1,400.00	Minnesota.
154	J. Albert Wise[6]	1,400	do	do	1,387.85	Dist. of Columb
155	D. H. Yount	1,400	do	do	1,400.00	Pennsylvania.
	CLASS 1.					
156	Carl Abbott	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	New Hampshire
157	Geo. B. Abrams	1,200	do	do	1,200.00	Vermont.
158	M. L. Ackerman	1,200	do	do	1,200.00	New Jersey.
159	Arthur W. Allen	1,200	do	do	1,200.00	South Carolina.
160	Edward Allen	1,200	do	do	1,200.00	Connecticut.
161	William J. Allen	1,200	do	do	1,200.00	Pennsylvania.
162	C. L. Altfather	1,200	do	do	1,200.00	Texas.
163	A. L. Ames	1,200	do	do	1,200.00	Iowa.
164	A. J. Anderson	1,200	do	do	1,200.00	Ohio.
165	C. N. Anderson	1,200	do	do	1,200.00	Mississippi.
166	W. Anderson	1,200	do	do	1,200.00	New York.
167	W. T. Andrews[3]	[7]1,000 1,200	do June 12, 1891	June 11, 1891 Nov. 30, 1891	532.02 561.54 1,093.56	Arkansas.
168	A. E. Angell	1,200	Dec. 1, 1890	do	1,200.00	Virginia.
169	Sam'l J. Armstrong	1,200	do	do	1,200.00	Pennsylvania.
170	Geo. M. Arnold	1,200	do	do	1,200.00	Virginia.
171	T. G. Ash	1,200	do	do	1,200.00	Kentucky.
172	Osborn Ashley	1,200	do	do	1,200.00	Illinois.
173	Geo. W. Ashworth	1,200	do	do	1,200.00	Rhode Island.

[1] Class 1.
[2] Promoted.
[3] Absent 6 days 1½ hours without pay.
[4] Absent ½ day without pay.
[5] Absent 2½ days without pay.
[6] Absent 3 days 1 hour without pay.
[7] Class $1,000.

nt showing names, compensation, etc., of clerks, messengers, etc.—Continued.

Names.	Annual salary.	Period of service. From—	To—	Amount received.	Residence when appointed.
Class 1—Continued.					
T. Asson	$1,200	Dec. 1, 1890	Nov. 30, 1891	$1,200.00	Pennsylvania.
I. Atwood	1,200	....do	....do	1,200.00	Illinois.
. Austin	1,200	....do	....do	1,200.00	Pennsylvania.
L. Austin	1,200	....do	....do	1,200.00	Arkansas.
. B. Avery[2]	$1,000	....do	Mar. 8, 1891	270.30	Rhode Island.
	1,200	Mar. 9, 1891	Nov. 30, 1891	875.57	
				1,145.87	
by E. Bain	1,200	Dec. 1, 1890	....do	1,200.00	Texas.
. Baird	1,200	....do	....do	1,200.00	West Virginia.
). Baker[3]	1,200	....do	....do	1,147.84	California.
n Baker	1,200	....do	....do	1,200.00	New Jersey.
ıan Ballard	1,200	....do	....do	1,200.00	New York.
. Baner	1,200	....do	....do	1,200.00	Illinois.
V. Barksdale[4]	1,200	....do	....do	1,198.40	Texas.
lrant Barnwell	1,200	....do	....do	1,400.00	Pennsylvania.
Barrick	1,200	....do	....do	1,400.00	West Virginia.
'. Barter[5]	1,200	....do	....do	1,170.68	Indiana.
. Barton	1,200	....do	....do	1,200.00	Kentucky.
I. Bayles	1,200	....do	....do	1,200.00	New Jersey.
. Beach	1,200	....do	....do	1,200.00	Michigan.
Bell, jr	1,200	....do	....do	1,200.00	Georgia.
. Bentley	1,200	....do	....do	1,200.00	Wisconsin.
r C. Black	1,200	....do	....do	1,200.00	Indiana.
I C. Blake	1,200	....do	....do	1,200.00	New Jersey.
. Bliss	1,200	....do	....do	1,200.00	Illinois.
. Boeger	1,200	....do	....do	1,200.00	Texas.
nk G. Bolles[6]	$1,000	....do	Mar. 8, 1891	270.32	Wisconsin.
	1,200	Mar. 9, 1891	Nov. 30, 1891	872.34	
				1,142.66	
. Bomsteen	1,200	Dec. 1, 1890	....do	1,200.00	Do.
lorbeck	1,200	....do	....do	1,200.00	New York.
t. Bradin	1,200	....do	....do	1,200.00	Do.
lter R. Bradley	1,200	....do	....do	1,200.00	Do.
s. Broderick	1,200	....do	....do	1,200.00	Dist. of Columbia.
. Brooks	1,200	....do	....do	1,200.00	Virginia.
I. P. Brown	1,200	....do	....do	1,200.00	Missouri.
L. Brown	1,200	....do	....do	1,200.00	Dist. of Columbia.
Brown	1,200	....do	....do	1,200.00	Do.
'. Brown	1,200	....do	....do	1,200.00	Maine.
k Burnham	1,200	....do	....do	1,200.00	Ohio.
. Burrhus	1,200	....do	....do	1,200.00	Iowa.
s. B. Buxton	1,200	....do	....do	1,200.00	New York.
l N. Calhoun[7]	1,200	....do	....do	1,177.19	Tennessee.
s. J. Calloway	1,200	....do	....do	1,200.00	Do.
d. G. Calvert	1,200	....do	....do	1,200.00	Maryland.
ed Cammack	1,200	....do	....do	1,200.00	Dist. of Columbia.
. Campbell	1,200	....do	....do	1,200.00	Dakota.
. Canfield	1,200	....do	....do	1,200.00	Iowa.
. H. Cardozo	1,200	....do	....do	1,200.00	South Carolina.
. Carroll	1,200	....do	....do	1,200.00	Maryland.
'. Carter	1,200	....do	....do	1,200.00	Georgia.
. Cary	1,200	....do	....do	1,200.00	Alabama.
. Casey	1,200	....do	....do	1,200.00	Louisiana.
ıes Caulfield	1,200	....do	....do	1,200.00	New York.
. W. Chase	1,200	....do	....do	1,200.00	Florida.
I. Church	1,200	....do	....do	1,200.00	Iowa.
s. J. Clark	1,200	....do	....do	1,200.00	New Jersey.
. Clarke	1,200	....do	....do	1,200.00	Alabama.
. F. Cobb	1,200	....do	....do	1,200.00	Massachusetts.
d B. Coe	1,200	....do	....do	1,200.00	South Carolina.
/. Collins	1,200	....do	....do	1,200.00	New York.
. Combs[8]	$1,000	....do	Dec. 31, 1890	84.20	Georgia.
	1,200	Jan. 1, 1891	Nov. 30, 1891	1,098.90	
				1,183.10	
arren Conard	1,200	Dec. 1, 1890	....do	1,200.00	Pennsylvania.
. B. Conger	1,200	....do	....do	1,200.00	Michigan.
l Cook	1,200	....do	....do	1,200.00	Arkansas.

s $1,000.
moted.
ent 16 days without pay.
ent ½ day without pay.

[6] Resigned Oct. 31, 1891. Appointed Nov. 10, 1891
[7] Promoted; absent 1 day without pay.
[8] Absent 7 days without pay.

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Annual salary.	Period of service.		Amount received.	Residence when appointed.
			From—	To—		
	CLASS 1—Continued.					
235	H. E. Copenhaver	$1,200	Dec. 1, 1890	Nov. 30, 1891	$1,200.00	Virginia.
236	E. P. Corvaizier[1]	1,200	....do	....do	1,190.20	New York.
237	Reuben Cox	1,200	....do	....do	1,200.00	Ohio.
238	David Cranmer	1,200	....do	....do	1,200.00	New York.
239	R. A. Crenshaw	1,200	....do	....do	1,200.00	Tennessee.
240	George R. Currier[2]	[2] 1,000	....do	Sept. 3, 1891	760.75	Maine.
		1,200	Sept. 4, 1891	Nov. 30, 1891	286.94	
					1,047.69	
241	Samuel Curtis	1,200	Dec. 1, 1890	....do	1,200.00	New York.
242	J. Madison Cutts	1,200	....do	....do	1,200.00	Dist. of Columbia.
243	F. E David[4]	1,200	....do	....do	1,196.60	Illinois.
244	Falconer Davidson	1,200	....do	....do	1,200.00	North Carolina.
245	Ben G. Davis	1,200	....do	....do	1,200.00	Nebraska.
246	W. C. Davis[5]	1,200	....do	....do	1,193.47	Kentucky.
247	Wm. M. Deck	1,200	....do	....do	1,200.00	West Virginia.
248	Geo. C. Deno	1,200	....do	....do	1,200.00	Dist. of Columbia.
249	Luke Devlin	1,200	....do	....do	1,200.00	Do.
250	Arthur L. Dietrich	1,200	....do	....do	1,200.00	Kentucky.
251	James Dodge	1,200	....do	....do	1,200.00	Maryland.
252	Wm. Donaldson	1,200	....do	....do	1,200.00	Pennsylvania.
253	R. J. Donnelly[3]	[2] 1,000	....do	Mar. 22, 1891	309.21	Missouri.
		1,200	Mar. 23, 1891	Nov. 30, 1891	828.90	
					1,138.11	
254	Geo. E. Doughty	1,200	Dec. 1, 1890	....do	1,200.00	Indiana.
255	A. S. Douglas	1,200	....do	....do	1,200.00	Vermont.
256	J. E. Douglas	1,200	....do	....do	1,200.00	Washington.
257	J. F. Douglas	1,200	....do	....do	1,200.00	California.
258	Jno. B. Dowd	1,200	....do	....do	1,200.00	Indiana.
259	Orville Drown	1,200	....do	....do	1,200.00	Vermont.
260	Wilbur F. Drown	1,200	....do	....do	1,200.00	Louisiana.
261	Wm. L. Drury	1,200	....do	....do	1,200.00	California.
262	Stephen Duncan	1,200	....do	....do	1,200.00	Do.
263	Thomas Dunn	1,200	....do	....do	1,200.00	Dist. of Columbia.
264	John F. Dunton	1,200	....do	....do	1,200.00	Massachusetts.
265	Nat. V. Easley	1,200	....do	....do	1,200.00	Tennessee.
266	Paul Eaton	1,200	....do	....do	1,200.00	Maine.
267	Chas. L. Ebaugh	1,200	....do	....do	1,200.00	Missouri.
268	R. C. Edmondson[3]	[2] 1,000	....do	Mar. 8, 1891	270.32	Texas.
		1,200	Mar. 9, 1891	Nov. 30, 1891	875.57	
					1,145.89	
269	B. F. Edwards[3]	[2] 1,000	Dec. 1, 1890	Mar. 10, 1891	275.88	Missouri.
		1,200	Mar. 11, 1891	Nov. 30, 1891	868.90	
					1,144.78	
270	W. W. Edwards	1,200	Dec. 1, 1890	....do	1,200.00	Arkansas.
271	H. Ellerbrook	1,200	....do	....do	1,200.00	Maryland.
272	B. M. Elliott	1,200	....do	....do	1,200.00	Indiana.
273	A. M. Evans	1,200	....do	....do	1,200.00	Pennsylvania.
274	B. F. Evans	1,200	....do	....do	1,200.00	Dist. of Columbia.
275	Thomas Evers	1,200	....do	....do	1,200.00	New York.
276	J. T. Exnicios[3]	[2] 1,000	....do	Sept. 30, 1891	834.20	Louisiana.
		1,200	Oct. 1, 1891	Nov. 30, 1891	198.90	
					1,033.10	
277	J. R. Fagan	1,200	Dec. 1, 1890	....do	1,200.00	Kansas.
278	D. W. Farlin	1,200	....do	....do	1,200.00	New York.
279	Homer Fellows	1,200	....do	....do	1,200.00	Missouri.
280	H. A. Fellows	1,200	....do	....do	1,200.00	Alabama.
281	Charles S. Fettis	1,200	....do	....do	1,200.00	Louisiana.
282	A. H. Fiegenbaum	1,200	....do	....do	1,200.00	Iowa.
283	Butler Fitch	1,200	....do	....do	1,200.00	New York.
284	S. A. Fitch	1,200	....do	....do	1,200.00	Kentucky.
285	Howard W. Fitz	1,200	....do	....do	1,200.00	Rhode Island.
286	C. A. Fleetwood	1,200	....do	....do	1,200.00	Maryland.
287	E. S. Fletcher	1,200	....do	....do	1,200.00	Pennsylvania.
288	Henry Floyd	1,200	....do	....do	1,200.00	Texas.
289	Sam'l W. Forrest	1,200	....do	....do	1,200.00	Indiana.
290	Joseph Fought	1,200	....do	....do	1,200.00	Pennsylvania.

[1] Absent 3 days without pay.
[2] Class $1,000.
[3] Promoted.
[4] Absent 1 day without pay.
[5] Absent 2 days without pay.

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS 1—Continued.					
291	F. A. Fowelr[1]	$1,200	Dec. 1, 1890	Nov. 30, 1891	$1,195.13	New York.
292	B. T. Franklin	1,200	....do	....do	1,200.00	Kentucky.
293	A. H. Frear	1,200	....do	....do	1,200.00	Wisconsin.
294	Alfred French	1,200	....do	....do	1,200.00	Ohio.
295	Fred. E. Fu ler[2]	[2]$1,000	Dec. 27, 1890	Sept. 30, 1891	763.59	Pennsylvania.
		1,200	[3]Oct. 1, 1891	Nov. 30, 1891	198.90	
					962.49	
296	Creed M. Fulton	1,200	Dec. 1, 1890	....do	1,200.00	Tennessee.
297	W. Gadsby	1,200	....do	....do	1,200.00	Dist. of Columbia.
298	P. J. Galligan[4]	[2]$1,000	....do	July 5 1891	597.79	Iowa.
		1,200	[5]July 6, 1891	Nov. 30, 1891	482.58	
					1,080.37	
299	Octavie Garesché	1,200	Dec. 1, 1890	....do	1,200.00	Missouri.
300	H. H. Gerdes	1,200	....do	....do	1,200.00	Dist. of Columbia.
301	Alonzo F. Getty	1,200	....do	....do	1,200.00	Maryland.
302	Thomas F. Gibbs	1,200	....do	....do	1,200.00	Massachusetts.
303	F. P. Gibson	1,200	....do	....do	1,200.00	Kentucky.
304	Chas. J. Giers	1,200	....do	....do	1,200.00	Alabama.
305	G. E. Giles	1,200	....do	....do	1,200.00	Wisconsin.
306	Wm. W. Giles	1,200	....do	....do	1,200.00	Pennsylvania.
307	R. H. Gilliam	1,200	....do	....do	1,200.00	Virginia.
308	A. N. Girault	1,200	....do	....do	1,200.00	New Jersey.
309	J. J. Goode	1,200	....do	....do	1,200.00	Illinois.
310	Wm. R. Goodman	1,200	....do	....do	1,200.00	Maryland.
311	Jacob Gotthilf	1,200	....do	....do	1,200.00	Dist. of Columbia.
312	E. J. Gray	1,200	....do	....do	1,200.00	Ohio.
313	William Griffin	1,200	....do	....do	1,200.00	New York.
314	T. J. Griffith	1,200	....do	....do	1,200.00	Arkansas.
315	Chas. Gulager	1,200	....do	....do	1,200.00	Pennsylvania.
316	Arthur A. Hall[6]	1,200	....do	....do	1,190.20	Michigan.
317	John W. Hall[4]	[2]$1,000	....do	Mar. 8, 1891	270.32	Georgia.
		1,200	Mar. 9, 1891	Nov. 30, 1891	875.57	
					1,145.89	
318	William Haller	1,200	Dec. 1, 1890	....do	1,200.00	New York.
319	Thos. Halstead	1,200	....do	....do	1,200.00	Pennsylvania.
320	James R. Hamilton	1,200	....do	....do	1,200.00	Texas.
321	S. F. Hamilton	1,200	....do	....do	1,200.00	New Jersey.
322	I. N. Hammer	1,200	....do	....do	1,200.00	Tennessee.
323	Chas. Hammond	1,200	....do	....do	1,200.00	New York
324	S. C. Hanson	1,200	....do	....do	1,200.00	Do.
325	Homer B. Harlan	1,200	....do	....do	1,200.00	Michigan.
326	C. A. Harper[4]	[2]$1,000	....do	Mar. 8, 1891	270.32	Wisconsin.
		1,200	Mar. 9, 1891	Nov. 30, 1891	875.57	
					1,145.89	
327	K. N. Harper	1,200	Dec. 1, 1890	....do	1,200.00	Pennsylvania.
328	Walton Harrison	1,200	....do	....do	1,200.00	Mississippi.
329	James P. Hart	1,200	....do	....do	1,200.00	Pennsylvania.
330	A. Hartenstein	1,200	....do	....do	1,200.00	Dist. of Columbia.
331	R. E. Harvey	1,200	....do	....do	1,200.00	Ohio.
332	Isaac Hawling	1,200	....do	....do	1,200.00	Virginia.
333	W. T. Hearst	1,200	....do	....do	1,200.00	Kansas.
334	Wm. Hebrew	1,200	....do	....do	1,200.00	Pennsylvania.
335	John F. Henry	1,200	....do	....do	1,200.00	New York.
336	J. T. Hensley	1,200	....do	....do	1,200.00	Ohio.
337[6]						
338	Wm. W. Hibbard	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	New York.
339	James H. Hilton	1,200	....do	....do	1,200.00	Dist. of Columbia.
340	Samuel N. Hilton	1,200	....do	....do	1,200.00	Arkansas.
341	Paul B. Hinzen	1,200	....do	....do	1,200.00	Kentucky.
342	Thos. D. Hitchcock	1,200	....do	....do	1,200.00	Iowa.
343	E. Holtzman	1,200	....do	....do	1,200.00	Dist. of Columbia.
344	Theodore Horn	1,200	....do	....do	1,200.00	Texas.
345	Alfred Hoss	1,200	....do	....do	1,200.00	Tennessee.
346	Helon H. House	1,200	....do	....do	1,200.00	Ohio.
347	Jas. H. Howard[7]	1,200	....do	....do	1,107.09	Maryland.
348	M. Hoyberger	1,200	....do	....do	1,200.00	Virginia.

[1] Absent 1½ days without pay.
[2] Class $1,000.
[3] Appointed Dec. 27, 1890, promoted.
[4] Promoted.
[5] Absent 3 days without pay.
[6] See Casualties.
[7] Absent 28½ days without pay.

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continued

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS 1—Continued.					
349	Augustus Hubbell	$1,200	Dec. 1, 1890	Nov. 30, 1891	$1,200.00	Vermont.
350	H. R. Hughes	1,200	do	do	1,200.00	Pennsylvania.
351	Wm. T. Hughes	1,200	do	do	1,200.00	Ohio.
352	O. M. Hundley[2]	[1] 1,000	do	Dec. 17, 1890	46.20	Alabama.
		1,200	Dec. 18, 1890	Nov. 30, 1891	1,144.55	
					1,190.75	
353	Edward H. Hunter	1,200	Dec. 1, 1890	do	1,200.00	North Carolina.
354	Ernest R. Hunting	1,200	do	do	1,200.00	New York.
355	W. H. Hyatt	1,200	do	do	1,200.00	Arkansas.
356	Thomas J. Irwin	1,200	do	do	1,200.00	Dist. of Columbi
357	Jacob Jacobson	1,200	do	do	1,200.00	Ohio.
358	M. M. Jarvis[3]	1,200	do	do	1,157.60	Michigan.
359	Wm. Jenkins	1,200	do	do	1,200.00	Tennessee.
360	D. L. E. Jennings	1,200	do	do	1,200.00	Do.
361	Charles A. Johnson	1,200	do	do	1,200.00	Missouri.
362	Lucretia E. Johnson	1,200	do	do	1,200.00	Maryland.
363	C. C. Jones	1,200	do	do	1,200.00	Alabama.
364	Chas. W Jones[4]	1,200	do	do	1,190.20	Michigan.
365	F. C. Jones[5]	1,200	do	do	1,195.80	Missouri.
366	J. Boyd Jones	1,200	do	do	1,200.00	Wisconsin.
367	James G. Jones	1,200	do	do	1,200.00	New Hampshire
368	James W. Jones	1,200	do	do	1,200.00	Alabama.
369	R. C. Jones	1,200	do	do	1,200.00	Dist. of Columbi
370	Thos. H. Jones[6]	1,200	do	do	1,187.01	Florida.
371	D. C. Jordan	1,200	do	do	1,200.00	Missouri.
372	Jos. Jouy	1,200	do	do	1,200.00	Illinois.
373	R. A. Kantz	1,200	do	do	1,200.00	Pennsylvania.
374	Chas. Katzenstein	1,200	do	do	1,200.00	Michigan.
375	Jas. V. Kearny	1,200	do	do	1,200.00	Illinois.
376	J. Claude Keiper	1,200	do	do	1,200.00	Pennsylvania.
377	Arthur Kelly	1,200	do	do	1,200.00	New Jersey.
378	Denis M. Kennedy	1,200	do	do	1,200.00	Texas.
379	P. M. Kennerly[7]	1,200	do	do	1,177.70	Do.
380	A. D. Kerr	1,200	do	do	1,200.00	Maryland.
381	S. R. Kiner	1,200	do	do	1,200.00	Illinois.
382	Wm. A. Kinnan	1,200	do	do	1,200.00	Michigan.
383	Geo. H. Knapp	1,200	do	do	1,200.00	New York.
384	H. D. Knapp	1,299	do	do	1,200.00	Michigan.
385	F'd'k Knoop	1,200	do	do	1,200.00	Dist. of Columbi
386	Wellington Kugler[2]	[1] 1,600	Dec. 1, 1890	Oct. 31, 1891	918.40	New Jersey.
		1,200	Nov. 1, 1891	Nov. 30, 1891	97.80	
					1,016.20	
387	J. L. Lake, jr	1,200	Dec. 1, 1890	do	1,200.00	Mississippi.
388	George Lawrence	1,200	do	do	1,200.00	Ohio.
389	Emma Leckie	1,200	do	do	1,200.00	Dist. of Columbi
390	W. W. Lecture	1,200	do	do	1,200.00	Do.
391	Eugene Leger[2]	[1] 1,000	Dec. 1, 1890	Sept. 30, 1891	834.20	Mississippi.
		1,200	Oct. 1, 1891	Nov. 30, 1891	198.90	
					1033.10	
392	John M. Leonard[2]	[1] 1,000	Dec. 1, 1890	April 6, 1891	350.68	Pennsylvania.
		1,000	April 7, 1891	Nov. 30, 1891	779.12	
					1,129.80	
393	T. H. Lewis	1,200	Dec. 1, 1890	do	1,200.00	Nevada.
394	Henry Liddell[8]	1,200	do	do	1,098.90	California.
395	J. F. Linden	1,200	do	do	1,200.00	Pennsylvania.
396	John H. Lindley	1,200	do	do	1,200.00	Illinois.
397	Harry Lipscomb[2]	[1] 1,000	do	Mar. 31, 1891	334.20	Tennessee.
		1,200	Apr. 1, 1891	Nov. 30, 1891	798.90	
					1,133.10	
398	F. B. Loftus[9]	1,200	Dec. 1, 1890	do	1,196.77	New York.
399	James A. Long	1,200	do	do	1,200.00	Illinois.
400	Alfred J. Lopez[10]	1,200	do	do	1,198.40	Louisiana.
401	Clifton Lowe	1,200	do	do	1,200.00	Iowa.

[1] Class $1,000.
[2] Promoted.
[3] Absent 13 days without pay.
[4] Absent 3 days without pay.
[5] Absent 1 day and 1 hour without pay.
[6] Absent 4 days without pay.
[7] Absent 7 days without pay.
[8] Absent 31 days without pay.
[9] Absent 1 day without pay.
[10] Absent ½ day without pay.

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS 1—Continued.					
12	Philander Lucas	$1,200	Dec. 1, 1890	Nov. 30, 1891	$1,200.00	Kansas.
13	Wm. Ludgate	1,200	....do	....do	1,200.00	New York
14	Amos Luke	1,200	....do	....do	1,200.00	Ohio.
15	W. McM. Luttrell	1,200	....do	....do	1,200.00	Tennessee.
16	Jeptha L. Lytton	1,200	....do	....do	1,200.00	Ohio.
17	Geo. H. McCarthy	1,200	....do	....do	1,200.00	Massachusetts.
18	Jno. McCarthy	1,200	....do	....do	1,200.00	Dist. Columbia.
19	John H. McCormick	1,200	....do	....do	1,200.00	Illinois.
10	D. P. McCornack	1,200	....do	....do	1,200.00	Wisconsin.
11	Patrick McEneany	1,200	....do	....do	1,200.00	Kansas.
12	Jay H. McFall	1,200	....do	....do	1,200.00	Wisconsin.
13	J. M. E. McKee	1,200	....do	....do	1,200.00	Pennsylvania.
14	C. E. McLaughlin[2]	[1]1,000	....do	July 2, 1891	589.63	Georgia.
		1,200	July 3, 1891	Nov. 30, 1891	492.37	
					1,082.00	
15	G. N. McLoughlin[2]	[1]1,000	Dec. 1, 1890	Oct. 15, 1891	874.96	Tennessee.
		1,200	Oct. 16, 1891	Nov. 30, 1891	149.47	
					1,024.43	
16	E. H. McMichael	1,200	Dec. 1, 1890	....do	1,200.00	Mississippi.
17	Sam'l McMonigle	1,200	....do	....do	1,200.00	Dist. Columbia.
18	Mahlon McMurphy	1,200	....do	....do	1,200.00	Kentucky.
19[3]						
20	John A. Magee	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Pennsylvania.
21	Jas. F. Maguire	1,200	....do	....do	1,200.00	Do
22	Denis Maher	1,200	....do	....do	1,200.00	Dist. Columbia.
23	Geo. W. Mankey[2]	[1]1,000	....do	May 5, 1891	430.34	Nebraska.
		1,200	May 6, 1891	Nov. 30, 1891	683.51	
					1,113.85	
24	Mich'l Manning	1,200	Dec. 1, 1890	....do	1,200.00	New York.
25	Ozias J. Markle	1,200	....do	....do	1,200.00	Iowa.
26	E. W. Marshall	1,200	....do	....do	1,200.00	Pennsylvania.
27	J. D. Marx	1,200	....do	....do	1,200.00	Maryland.
28	Edward P. Masi	1,200	....do	....do	1,200.00	Wyoming.
29	Hugh Masterson	1,200	....do	....do	1,200.00	Dist. Columbia.
30	O. M. Mather	1,200	....do	....do	1,200.00	Kentucky.
31	John C. Maxwell	1,200	....do	....do	1,200.00	New York.
32	Chris Mead	1,200	....do	....do	1,200.00	Massachusetts.
33	E. N. Meekins	1,200	....do	....do	1,200.00	North Carolina.
34	Wm. Mehn	1,200	....do	....do	1,200.00	Louisiana.
35	W. H. Mellach	1,200	....do	....do	1,200.00	New Jersey.
36	Silas Merchant	1,200	....do	....do	1,200.00	Do.
37	Norris H. Merrill	1,200	....do	....do	1,200.00	Kansas.
38	P. Brooks Merritt	1,200	....do	....do	1,200.00	Massachusetts.
39	A. Meyer	1,200	....do	....do	1,200.00	Dist. of Columbia.
40	Benj. F. Miller	1,200	....do	....do	1,200.00	New York.
41	Charles R. Miller	1,200	....do	....do	1,200.00	Ohio.
42	J. A. Miller	1,200	....do	....do	1,200.00	New York.
43	Fred'k M. P Montague[4]	1,200	....do	....do	1,198.40	Virginia.
44	L. M. Mooers	1,200	....do	....do	1,200.00	Iowa.
45	C. J. Moore	1,200	....do	....do	1,200.00	New York.
46	E. W. Moore	1,200	....do	....do	1,200.00	Pennsylvania.
47	S. A. Moreland	1,200	....do	....do	1,200.00	Texas.
48	Laurence Morisey	1,200	....do	....do	1,200.00	Dist. of Columbia.
49	L. D. Mowry, jr	1,200	....do	....do	1,200.00	South Carolina.
50	H. T. B. Moy[2]	[1]1,000	Dec. 6, 1890	June 5, 1891	501.99	Illinois.
		1,200	June 6, 1891	Nov. 30, 1891	581.32	
					1,083.31	
51	W. H. Moyer[2]	1,000	Dec. 1, 1890	Mar. 8, 1891	270.32	Pennsylvania.
		1,200	Mar. 9, 1891	Nov. 30, 1891	875.57	
					1,145.89	
52	S. A. Muhleman	1,200	Dec. 1, 1890	....do	1,200.00	West Virginia.
53	M. T. Mulledy	1,200	....do	....do	1,200.00	Louisiana.
54	Daniel C. Murphy[5]	1,200	....do	....do	1,154.36	California.
55	F. H. M. Murray	1,200	....do	....do	1,200.00	Ohio.
56	J. George Naylor, jr	1,200	....do	....do	1,200.00	Dist. of Columbia.

[1] Class $1,000.
[2] Appointed December 6, 1890. Promoted.
[3] See Casualties.
[4] Absent ½ day without pay.
[5] Absent 14 days without pay.

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Annual salary.	Period of service. From—	To—	Amount received.	Residence when appointed.
	CLASS 1—Continued.					
457	Frank D. Neale	$1,200	Dec. 1, 1890	Nov. 30, 1891	$1,200.00	Wisconsin.
458	S. W. Needham	1,200	....do	....do	1,200.00	Kentucky.
459	Burrows Nelson	1,200	....do	....do	1,200.00	West Virginia.
460	James Nelson	1,200	....do	....do	1,200.00	Montana.
461	John B. Nesbitt	1,200	....do	....do	1,200.00	Dist. of Columbia.
462	Nathan'l Nesbitt	1,200	....do	....do	1,200.00	Alabama.
463	J. D. Nevius	1,200	....do	....do	1,200.00	Texas.
464	Thos. C. Newton	1,200	....do	....do	1,200.00	Georgia.
465	Anna G. Neyhart	1,200	....do	....do	1,200.00	Pennsylvania.
466	James E. Nichol	1,200	....do	....do	1,200.00	Michigan
467	Edwin A. Neiss	1,200	....do	....do	1,200.00	Pennsylvania.
468	Chas. C. Noonnan	1,200	....do	....do	1,200.00	New York.
469	John H. D. Nordeman	1,200	....do	....do	1,200.00	Illinois.
470	J. L. Norris	1,200	....do	....do	1,200.00	Maryland.
471	H. E. Noteman	1,200	....do	....do	1,200.00	Kansas.
472	B. J. O'Driscoll	1,200	....do	....do	1,200.00	New York.
473	Patrick O'Hagan	1,200	....do	....do	1,200.00	Dist. of Columbia.
474	Geo. F. O'Hair	1,200	....do	....do	1,200.00	Indiana.
475	M. T. O'Leary	1,200	....do	....do	1,200.00	Massachusetts.
476	Henry Page	1,200	....do	....do	1,200.00	Illinois.
477	C. C. Palmer	1,200	....do	....do	1,200.00	Kansas.
478	W. D. Palmer	1,200	....do	....do	1,200.00	New York.
479	Frank E. Park	1,200	....do	....do	1,200.00	Indiana.
480	William W. Parker	1,200	....do	....do	1,200.00	Maryland.
481	C. A. Perkins	1,200	....do	....do	1,200.00	Dist. of Columbia.
482	U. G. Perry[2]	[1]1,000	....do	May 5, 1891	430.34	Pennsylvania.
		1,200	May 6, 1891	Nov. 30, 1891	683.51	
					1,113.85	
483	W. S. Perry	1,200	Dec. 1, 1891	....do	1,200.00	New York.
484	Chas. W. Petersen	1,200	....do	....do	1,200.00	Dist. of Columbia.
485	J. H. Piles	1,200	....do	....do	1,200.00	Ohio.
486	J. W. Piles	1,200	....do	....do	1,200.00	Missouri.
487	Wm. Platt	1,200	....do	....do	1,200.00	Pennsylvania.
488	M. G. Porter	1,200	....do	....do	1,200.00	At large.
489	L. O. Posey	1,200	....do	....do	1,200.00	South Carolina.
490	B. A. P'Pool[2]	[1]1,000	....do	May 5, 1891	430.34	Kentucky.
		1,200	May 6, 1891	Nov. 30, 1891	683.51	
					1,113.85	
491[3]		1,200				
492	A. L. Pratt	1,200	Dec. 1, 1890	....do	1,200.00	California.
493	M. Pursel	1,200	....do	....do	1,200.00	Virginia.
494	Will H. Ramsey	1,200	....do	....do	1,200.00	Ohio.
495	F. Randolph	1,200	....do	....do	1,200.00	Wisconsin.
496	Aug. H. Raymond	1,200	....do	....do	1,200.00	Do.
497	Jno. L. Rea	1,200	....do	....do	1,200.00	Ohio.
498	H. W. Reed	1,200	....do	....do	1,200.00	Wisconsin.
499	J. G. Reeves	1,200	....do	....do	1,200.00	Illinois.
500	B. W. Reiss	1,200	....do	....do	1,200.00	Dist. of Columbia.
501	W. B. Renner	1,200	....do	....do	1,200.00	Do.
502	Chas. A. Rhetts[4]	[1]1,000	Dec. 16, 1890	Sept. 30, 1891	793.48	Indiana.
		1,200	Oct. 1, 1891	Nov. 30, 1891	198.90	
					992.38	
503	J. H. Richardson[5]	1,200	Dec. 1, 1890	....do	1,098.74	Ohio.
504	Wm. T. Richardson	1,200	....do	....do	1,200.00	Dist. of Columbia.
505	Wm. Ricketts	1,200	....do	....do	1,200.00	Do.
506	J. H. Rindlaub[2]	[1]1,000	....do	Mar. 2, 1891	253.60	Wisconsin.
		1,200	Mar. 3, 1891	Nov. 30, 1891	895.57	
					1,149.17	
507	Wm. P. Ripley	1,200	Dec. 1, 1890	....do	1,200.00	Louisiana.
508	A. J. Robbins	1,200	....do	....do	1,200.00	Texas.
509	Geo. W. Roby	1,200	....do	....do	1,200.00	Maryland.
510	W. F. Roe[2]	[1]1,000	....do	Mar. 31, 1891	334.20	New York.
		1,200	Apr. 1, 1891	Nov. 30, 1891	798.90	
					1,133.10	
511	A. C. Ronne	1,200	Dec. 1, 1890	....do	1,200.00	Dist. of Columbia.

[1] Class $1,000.
[2] Promoted.
[3] See casualties.
[4] Appointed December 16, 1890; promoted.
[5] Absent 31 days without pay.

tatement showing names, compensation, etc., of clerks, messengers, etc.—Continued.

o.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS 1—Continued.					
2	D. W. Ronsaville	$1,200	Dec. 1, 1890	Nov. 30, 1891	$1,200.00	Maryland.
3	W. T. Rosenbaum	1,200	....do	....do	1,200.00	Nebraska.
4	Geo. M. Rowe	1,200	....do	....do	1,200.00	Colorado.
5	J. Sabine	1,200	....do	....do	1,200.00	Massachusetts.
6	E. D. Safford	1,200	....do	....do	1,200.00	New York.
7	George H. Safford	1,200	....do	....do	1,200.00	Alabama.
8	Madison Sallade[1]	1,200	....do	....do	1,200.00	Pennsylvania.
9	W. J. Sandoz[2]	[1]1,000 1,200	....do Jan. 1, 1891	Dec. 31, 1890 Nov. 30, 1891	81.52 1,098.90 1,180.42	Louisiana.
20	D. K. Sargent	1,200	Dec. 1, 1890	....do	1,200.00	Iowa.
21	Charles B. Sayer	1,200	....do	....do	1,200.00	Pennsylvania.
22	Wm. N. Sayre[3]	[1]1,000 1,200	....do Apr. 1, 1891	Mar. 31, 1891 Nov. 30, 1891	334.20 798.90 1,133.10	Oregon.
23	Arthur Schatz[4]	1,200	Dec. 1, 1890	....do	1,023.92	Missouri.
24	Isaac W. Scherich	1,200	....do	....do	1,200.00	Iowa.
25	John H. Seiffert	1,200	....do	....do	1,200.00	Dist. of Columbia.
26	H. W. Selah	1,200	....do	....do	1,200.00	Nebraska.
27	Robt. R. Selden	1,200	....do	....do	1,200.00	Dist. of Columbia.
28	C. D. Shadbolt	1,200	....do	....do	1,200.00	Missouri.
29	H. M. Shannon[5]	1,200	....do	....do	1,195.17	Illinois.
30	John Shea	1,200	....do	....do	1,200.00	Dist. of Columbia.
31	Charles W. Shewalter	1,200	....do	....do	1,200.00	Ohio.
32	E. G. Shull[3]	[1]1,000 1,200	....do Apr. 24, 1891	Apr. 23, 1891 Nov. 30, 1891	397.39 723.08 1,120.47	Kansas.
33	Wm. W. Slate	1,200	Dec. 1, 1890	....do	1,200.00	Vermont.
34	Charles G. Smith	1,200	....do	....do	1,200.00	Do.
35	Frank B. Smith[3]	[1]1,000 1,200	....do Oct. 1, 1891	Sept. 30, 1891 Nov. 30, 1891	834.20 198.90 1,033.10	Tennessee.
36	H. A. Smith	1,200	Dec. 1, 1890	....do	1,200.00	Massachusetts.
37	H. J. Smith	1,200	....do	....do	1,200.00	Dist. of Columbia.
38	J. T. Smith	1,200	....do	....do	1,200.00	Indiana.
39	William R. Smith, sr	1,200	....do	....do	1,200.00	New York.
40	George W. Smoot[6]	1,200	....do	....do	1,196.73	Maryland.
41	Jas. J. Smyth	1,200	....do	....do	1,200.00	Tennessee.
42	Chas. L. Snyder	1,200	....do	....do	1,200.00	Michigan.
43	Francis Soevyn	1,200	....do	....do	1,200.00	New York.
44	Edgar Speiden	1,200	....do	....do	1,200.00	Dist. of Columbia.
45	W. T. Spencer	1,200	....do	....do	1,200.00	Iowa.
46	John P. Sprecher[3]	[1]1,000 1,200	....do Apr. 24, 1891	Apr. 23, 1891 Nov. 30, 1891	397.39 723.08 1,120.47	Nebraska.
47	R. Springsguth	1,200	Dec. 1, 1890	....do	1,200.00	New York.
48	A. F. Springsteen[7]	1,200	....do	....do	1,198.40	Indiana.
49	N. H. Stanton	1,200	....do	....do	1,200.00	Pennsylvania.
50	W. G. Steward	1,200	....do	....do	1,200.00	Louisiana.
51	J. A. Stewart[8]	1,200	....do	....do	1,167.38	Pennsylvania.
52	Jos. H. Stewart	1,200	....do	....do	1,200.00	Tennessee.
53	Jas. M. Stewart	1,200	....do	....do	1,200.00	Massachusetts.
54	Wm. B. Stokes	1,200	....do	....do	1,200.00	Indiana.
55	Elizabeth D. Stone[9]	1,200	July 1, 1891	....do	498.90	Massachusetts.
56	W. H. Stovall	1,200	Dec. 1, 1890	....do	1,200.00	Tennessee.
57	S. L. Straughan	1,200	....do	....do	1,200.00	Texas.
58	H. R. Street	1,200	....do	....do	1,200.00	California.
59	Isaac Strohm	1,200	....do	....do	1,200.00	Ohio.
60	B. W. Summy	1,200	....do	....do	1,200.00	Dist. of Columbia.
61	G. W. Talburtt	1,200	....do	....do	1,200.00	Kentucky.
62	J. L. Taylor	1,200	....do	....do	1,200.00	Pennsylvania.
63	Osborn T. Taylor	1,200	....do	....do	1,200.00	Arkansas.

[1] Class 1,000.
[2] Absent 1 day without pay; promoted.
[3] Promoted.
[4] Absent 54 days without pay.
[5] Abent 1½ days without pay.
[6] Absent 1 day without pay.
[7] Absent ½ day without pay.
[8] Absent 10 days without pay.
[9] Transferred from office Quartermaster-General.

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continued

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS 1—Continued.					
564	Geo. P. Tenney	$1,200	Dec. 1, 1890	Nov. 30, 1891	$1,200.00	New Hampshire
565	F. W. Test	1,200	do	do	1,200.00	Illinois.
566	H. C. Thomas	1,200	do	do	1,200.00	Dist. of Columbi
567	Edwin S. Thompson	1,200	do	do	1,200.00	Texas.
568	Elias B. Thompson	1,200	do	do	1,200.00	Virginia.
569	Smith Thompson[1]	1,200	do	do	1,193.50	Maryland.
570	S. C. Thompson	1,200	do	do	1,200.00	Pennsylvania.
571	Wilson H. Thompson	1,200	do	do	1,200.00	Virginia.
572	Wm. J. R. Thönssen	1,200	do	do	1,200.00	Texas.
573	Edward L. Thornton	1,200	do	do	1,200.00	North Carolina.
574	H. W. Throckmorton	1,200	do	do	1,200.00	Virginia.
575	Ashton Todd	1,200	do	do	1,200.00	Do.
576	R. B. Travers	1,200	do	do	1,200.00	Dist. of Columbi
577	C. E. Troutman[2]	1,200	do	do	1,187.44	Pennsylvania.
578	E. Turner	1,200	do	do	1,200.00	Texas.
579	G. E. Tyler[4]	[3]1,000	do	May 6, 1891	433.08	Nebraska.
		1,200	May 7, 1891	Nov. 30, 1891	680.22	
					1,113.30	
580	Rudolph Ullmer	1,200	Dec. 1, 1891	do	1,200.00	Dist. of Columbi
581	C. H. Underwood	1,200	do	do	1,200.00	Pennsylvania.
582	Jesse W. Underwood	1,200	do	do	1,200.00	Illinois.
583	H. C. Upperman	1,200	do	do	1,200.00	Maryland.
584	John A. Van Doren	1,200	do	do	1,200.00	Indiana.
585	Fred. Van Vranken	1,200	do	do	1,200.00	Michigan.
586	John J. Veazie[5]	1,200	do	do	1,196.77	Mississippi.
587	Otto Voss	1,200	do	do	1,200.00	Louisiana.
588	Bernard Wagner	1,200	do	do	1,200.00	Indiana.
589	F. H. Wagner	1,200	do	do	1,200.00	Pennsylvania.
590	G. R. Wales	1,200	do	do	1,200.00	Vermont.
591	Robt. J. Walker	1,200	do	do	1,200.00	Massachusetts.
592	Thomas Walker	1,200	do	do	1,200.00	Alabama.
593	Saml. R. Warren	1,200	do	do	1,200.00	New York.
594	B. G. Wasdon	1,200	do	do	1,200.00	Arkansas.
595	David S. Waters	1,200	do	do	1,200.00	Kentucky.
596	Wm. U. Watson	1,200	do	do	1,200.00	Iowa.
597	D. Weaver	1,200	do	do	1,200.00	Pennsylvania.
598	Stanton Weaver	1,200	do	do	1,200.00	Ohio.
599	R. P. Wendel	1,200	do	do	1,200.00	Mississippi.
600	G. E. Werber	1,200	do	do	1,200.00	South Carolina.
601	G. C. West	1,200	do	do	1,200.00	Kansas.
602	Edmund Weston	1,200	do	do	1,200.00	Vermont.
603	Geo. F. Wetzerich	1,200	do	do	1,200.00	Dist. of Columbia.
604	Jas. A. White	1,200	do	do	1,200.00	Georgia.
605	N. F. White	1,200	do	do	1,200.00	Connecticut.
606	A. S. Whiteside	1,200	do	do	1,200.00	Maryland.
607	A. P. Whitney	1,200	do	do	1,200.00	New York.
608	Wm. C. Whitney	1,200	do	do	1,200.00	Dist. of Columbia.
609	G. A. Wight[6]	1,200	do	do	1,198.40	Maine.
610	F. M. Williams[6]	1,200	do	do	1,196.73	Wisconsin.
611	Sherman Williams	1,200	do	do	1,200.00	Texas.
612	S. J. Willis	1,200	do	do	1,200.00	Minnesota.
613[7]						
614	Geo. J. P. Wood	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Indiana.
615	S. B. Woodward	1,200	do	do	1,200.00	New Hampshire.
616	N. T. Worley	1,200	do	do	1,200.00	Tennessee.
617	Jas M. Wright, jr	1,200	do	do	1,200.00	Dist. of Columbia.
618	Harry Wyckoff	1,200	do	do	1,200.00	New Jersey.
619	Harry H. Wyeth	1,200	do	do	1,200.00	Maryland.
620	S. P. York	1,200	do	do	1,200.00	New York.
621	Claude R. Zappone	1,200	do	do	1,200.00	Georgia.
622						
623	Fred Achenbach[8]	[3]1,200	Apr. 17, 1891	Nov. 19, 1891	591.89	Missouri.
		1,200	Nov. 20, 1891	Nov. 30, 1891	35.87	
					627.76	

[1] Absent 2 days without pay.
[2] Absent 3½ days and 2½ hours without pay.
[3] Class $1,000.
[4] Promoted.
[5] Absent 1 day without pay.
[6] Absent ½ day without pay.
[7] See casualties.
[8] Appointed Apr. 17, 1861. Promoted.

it showing names, compensation, etc., of clerks, messengers, etc.—Continued.

CLASS $1,000 AND COPYISTS.

[Copyists $900.]

Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.	Remarks.
L. Allen	$1,000	Dec. 5, '90	Nov. 30, '91	$989.17	Pa	App. Dec. 5, 1890.
y E. Arnold	900	Dec. 1, '90	Nov. 2, 91	831.49	Tex	Promoted.
	1,000	Nov. 3, '91	Nov. 30, '91	76.09		
				907.58		
C. Ballou	1,000	Apr. 13, '91	....do	682.85	Mass	App. Apr. 13, 1891.
V. Barnes	1,000	May 26, '91	....do	514.68	N. C	App. May 26, 1891.
red Beck	1,000	Dec. 1, '90	....do	1,000.00	Ill	
n S. Bethel	1,000	Mar. 20, '91	....do	699.13	Ill	App. Mar. 20, 1891.
)h F. Bixler	1,000	Apr. 14, '91	....do	630.10	Pa	App. Apr. 14, 1891.
R. Blair	1,000	June 15, '91	....do	459.76	N. Y	App. June 15, 1891.
as B Bowman	1,000	Dec. 1, '90	....do	1,000.00	Mo	
B. Bradshaw	1,000	....do	....do	1,000.00	N. Y	
am D. Brand	1,000	Apr. 1, '91	....do	665.80	Mo	App. Apr. 1, 1891.
y E. Brandon	900	Dec. 1, '90	Oct. 31, '91	826.60	N. Y	Promoted.
	1,000	Nov. 1, '91	Nov. 30, '91	81.60		
				908.20		
auner	1,000	Dec. 1, '90	....do	1,000.00	Tex	
E. Brooks	900	....do	July 31, '91	525.80	Ohio	Promoted.
	1,000	Aug. 1, '91	Nov. 30, '91	331.60		
				857.40		
Chandler	1,000	Dec. 1, '90	....do	1,000.00	N. J	
E. Chapin	1,000	....do	....do	1,000.00	S. C	
lton M. Clark	1,000	....do	....do	1,000.00	Miss	
i S. Clark	1,000	....do	....do	968.62	N. Y	Absent 6 days without pay.
h G. Clark	1,000	May 21, 91	....do	528.42	Ill	App. May 21, 1891.
. Clyborne	900	May 28, '91	Sept. 3, '91	243.03	Cal	App. May 28, 1891. Promoted.
	1,000	Sept. 4, '91	Nov. 30, '91	239.17		
				482.20		
. Collings	1,000	Dec. 27, '90	....do	929.39	Ill	App. Dec. 27, 1890.
r F. Conant	1,000	May 26, '91	....do	514.68	Me	App. May 26, 1891.
J. Cooke	900	Dec. 1, '90	Aug. 31, '91	677.40	Tenn.	Promoted.
	1,000	Sept. 1, '91	Nov. 30, '91	274.40		
				951.80		
ttrell, jr	900	Jan. 12, '91	Mar. 8, '91	140.00	Pa	App. Jan. 12, 1891. Promoted.
	1,000	Mar. 9, '91	Nov. 30, '91	729.69		
				869.69		
Crosby	1,000	Oct. 23, '91	....do	106.06	Iowa	Transferred from office Chief of Engineers.
ge F. Daggett	1,000	Dec. 1, '90	....do	1,000.00	Me	
W. Davis	1,000	....do	....do	1,000.00	Mo	
ge E. Dayton	900	....do	Jan. 15, '91	113.30	N. J	Promoted.
	1,000	Jan. 16, '91	Nov. 30, '91	874.14		
				987.44		
. Deadrick	900	Dec. 1, '90	Sept. 30, '91	750.80	Tenn.	Promoted.
	1,000	Oct 1, '91	Nov. 30, '91	165.80		
				916.60		
Easterling	1,000	Dec. 1, '90	....do	1,000.00	Kans.	
Edwards	1,000	....do	....do	1,000.00	Ga	
Exline	1,000	Dec. 11, '90	....do	972.87	Ind	App. Dec. 11, 1890.
Fairly	1,000	Dec. 1, '90	....do	1,000.00	Miss	
ar L. Falconer	1,000	....do	....do	1,000.00	Tex	
Faulkner	1,000	....do	....do	1,000.00	Miss	
) H. Feaster	1,000	Dec. 12, '90	....do	970.15	Ark	App. Dec. 12, 1890
B. Ferguson	900	Dec. 1, '90	July 2, '91	530.69	Ky	Promoted
	1,000	July 3, '91	Nov. 30, '91	410.40		
				941.09		

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continued

CLASS $1,000 AND COPYIST—Continued

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.	Remarks.
661	W. H. Fossett	$1,000	Dec. 8, '90	Nov. 30, '91	$961.02	Ohio	App. Dec. 8, 18
662	Geo. W. Fox	1,000	Dec. 1, '90	do	997.32	La	Absent 1 day without pay.
663	James R. Funk	1,000	Feb. 1, '91	do	829.70	Pa	App. Feb. 1, 18
664	H. W. Furniss	$900	Feb. 13, '91	Mar. 8, '91	860.00	Ind	App. Feb. 13, Promoted.
		1,000	Mar. 9, '91	Nov. 30, '91	729.69		
					789.69		
665	Joseph B. Gage	1,000	Dec. 1, '90	do	1,000.00	Mich	
666	W. M. Grogan	$900	do	July 31, '91	601.60	Ga	Absent 1½ d without Promoted.
		1,000	Aug. 1, '91	Nov. 30, '91	327.48		
					929.08		
667	Michael A. Gruber	1,000	May 16, '91	do	542.16	Pa	App. May 16,
668	C. F. Hadfield	$900	Dec. 1, '90	July 31, '91	601.60	R. I	Promoted.
		1,000	Aug. 1, '91	Nov. 30, '91	331.60		
					933.20		
669	J. M. Hance	1,000	Dec. 15, '90	do	962.00	Ohio	App. Dec. 15, 1
670							See casulties.
671	B. E. Harper	900	Dec. 1, '90	Oct. 25, '91	811.94	Iowa	Promoted.
		1,000	Oct. 26, '91	Nov. 30, '91	97.90		
					909.84		
672	Leroy H. Harris	900	Dec. 1, '90	Oct. 13, '91	782.59	Miss	Do.
		1,000	Oct. 14, '91	Nov. 30, '91	130.51		
					913.10		
673	W. H. Hastie	1,000	Dec. 1, '90	do	[1]1,000.00	Tenn	
674	C. F. Hathaway	1,000	do	do	1,000.00	Ohio	
675	J. H. Henderson	1,000	do	do	993.13	Miss	Absent 2½ d without pay.
676	Chas. M. Holbrook	900	do	Oct. 13, '91	782.59	Ala	Promoted.
		1,000	Oct. 14, '91	Nov. 30, '91	130.51		
					913.10		
677	Wm. L. Houston	900	Dec. 1, '90	July 2, '91	530.69	Ky	Do.
		1,000	July 3, '91	Nov. 30, '91	410.40		
					941.09		
678	Thomas Hynes	[1]1,200	Dec. 1, '90	Mar. 5, '91	314.47	Mo	Discharged 5, 1891. App. 3, 1891.
		1,000	Sept. 3, '91	Nov. 30, '91	241.89		
					556.36		
679	O. M. Jackson	1,000	Dec. 1, '90	do	1,000.00	do	
680	Will M. Jackson	1,000	do	do	1,000.00	Ky	
681	Bert A. Johnson	1,000	Apr. 15, '91	do	627.36	Iowa	App. Apr. 15, 1
682	Thos. A. Johnson	1,000	Dec. 1, '90	do	1,000.00	Ga	
683	Wm. A. Joiner	1,000	Dec. 15, '90	do	962.00	Ill	App. Dec. 15, 1
684	A. B. Keefer	1,000	Dec. 1, '90	do	1,000.00	Pa	
685	Wm. W. Kittell	1,000	July 6, '91	do	402.15	Nebr	App. July 6, 18
686	A. G. Knapp	1,000	Feb. 7, '91	do	810.01	N. Y	App. Feb. 7, 18
687	Wm. J. Leib	1,000	Dec. 1, '90	do	1,000.00	D. C	
688	Thos. H. Levering	1,000	do	do	1,000.00	Tenn	
689	E. H. Lipscombe	1,000	do	do	1,000.00	N. C	
690	P. S. Lowry	1,000	do	do	1,000.00	Ohio	
691	J. R. McCoach	1,000	Jan. 5, '91	do	904.70	Pa	App. Jan. 5, 1
692	C. S. McLaughlin	1,000	Dec. 1, '90	do	1,000.00	do	
693	W. H. Martin	1,000	do	do	1,000.00	N. Y	
694	M. A. Michaels	900	do	June 30, '91	525.80	S. C	Promoted.
		1,000	July 1, '91	Nov. 30, '91	415.80		
					941.60		
695	H. S. Miller	1,000	Dec. 1, '91	do	1,000.00	Ohio	
696	John D. Morgan	1,000	Jan. 12, '91	do	885.26	Wash	App. Jan. 5, 1
697	S. T. Neal	1,000	Dec. 1, '90	do	972.55	Tex	Absent 10 without pay

[1] Class 1.

t showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

CLASS $1,000 AND COPYISTS—Continued.

Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.	Remarks.
Owen	$1,000	Dec. 1, '90	Nov. 30, '91	$1,000.00	Ala.	
H. Patterson	1,000	....do	....do	1,000 00	Ark.	
Paull	900	....do	Sept. 30, '91	750. 80	Ohio	Absent 1 day without pay. Promoted.
	1,000	Oct. 1, '91	Nov. 30, '91	163.00		
				913. 80		
Y. Peck	1,000	Jan. 17, '91	....do	871. 37	Iowa	App. Jan. 17, 1891.
K. Pennington	1,000	Dec. 1, '90	....do	1,000.00	Ala.	
Philipsen	1,000	....do	....do	975. 11	La.	Absent 9 days without pay.
ce Piper	1,000	....do	....do	1,000.00	Me.	
S. Poler	1,000	....do	....do	1,000.00	N. Y.	
Porter[1]	1,000	....do	Nov. 17, '91	964. 60	Miss.	Promoted.
	1,200	Nov. 18, '91	Nov. 30, '91	42, 39		
				1,006. 99		
Powell	1,000	Dec. 1, '90	....do	1,000.00	Ind.	
T. Prewitt[1]	1,000	....do	Nov. 20, '91	972. 75	Tex.	Do.
	1,200	Nov. 21, '91	Nov. 30, '91	32. 61		
				1,005. 36		
er B. Randall	900	Dec. 1 '90	Oct. 13, '91	782. 59	La.	Do.
	1,000	Oct. 14, '91	Nov. 30, '91	130. 51		
				913. 10		
r E. Rankin	1,000	Dec. 1, '90	....do	1,000.00	Ind.	
K. Rector	1,000	....do	....do	1,000.00	Ark.	
Richardson	900	....do	Aug. 31, '91	677. 40	Iowa	Do.
	1,000	Sept. 1, '91	Nov. 30, '91	247. 40		
				924. 80		
. Rochester, jr	1,000	Dec. 1, '90	....do	1,000.00	N. Y.	
Rose	1,000	....do	....do	1,000.00	Ind.	
es S. Rozzell	1,000	....do	....do	1,000.00	N.C.	
Sabin	1,000	Apr. 18, '91	....do	602. 64	Wis.	Absent 6 days without pay. App. Apr. 18, 1891.
Sams	1,000	Dec. 1, '90	....do	1,000.00	Ill.	
ld N. Saxton	1,000	....do	....do	1,000.00	N. Y.	
. Scott	900	....do	Oct. 31, '91	826. 60	Ala.	Promoted.
	1,000	Nov. 1, '91	Nov. 30, '91	81. 60		
				908. 20		
arrison Scott	900	Dec. 1, '90	Oct. 25, '91	811. 94	Miss.	Do.
	1,000	Oct. 26, '91	Nov. 30, '91	97. 90		
				909. 84		
s B. Sitler	1,000	Dec. 1, '90	....do	1,000.00	Pa.	
Sommers	1,000	....do	....do	1,000.00	Ohio.	
Steele	900	....do	Sept. 30, '91	750. 80	Ga.	Absent 2 days, 1 hour without pay. Promoted.
	1,000	Oct. 1, '91	Nov 30, '91	159. 90		
				910. 70		
Sturgus	1,000	May 22, '91	....do	525. 67	Iowa.	App. May 22, 1891.
s Sullivon	1,000	May 21, '91	....do	528. 42	Ill.	App. May 21, 1891.
Taylor	1,000	Dec. 1, '91	....do	998. 56	Ohio.	Absent ½ day without pay.
Thompson	1,000	....do	....do	1,000.00	Mass.	
B. Tolman	900	....do	Sept. 30, '91	750. 80	..do..	Promoted.
	1,000	Oct. 1, '91	Nov. 30, '91	165. 80		
				916. 60		
Tyler	1,000	Dec. 24, '90	....do	937. 54	Nebr.	App. Dec. 24, 1890.
. Valentine	1,000	Dec. 11, '90	....do	972. 87	N. Y.	App. Dec. 11. 1890.

[1] Class 1.

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

CLASS $1,000 AND COPYISTS—Continued.

No.	Names.	Annual salary.	Period of service.		Amount received.	Residence when appointed.	Remarks.
			From—	To—			
731	James H. Van Houten.	$1,000	Dec. 1, '90	Nov. 30, '91	$1,000.00	Ind...	
732	S. A. Ward	1,000	....do	....do	1,000.00	La....	
733	M. M. Warren	1,000	....do	....do	1,000.00	Tenn.	
734	Richard Washington	1,000	....do	....do	1,000.00	N. Y..	
735	J. Edw. Waterbury	1,000	May 15, '91	....do	544.90	..do...	App. May 15, 1891.
736	Thos. M. Weaver	1,000	Jan. 31, '91	....do	832.48	Iowa.	App. Jan. 31, 1891.
737	Drury E. Webb	1,000	Dec. 1, '90	....do	982.18	Tenn.	Absent 6½ days without pay.
738	D. P. Webster	1,000	Dec. 13, '90	....do	967.43	..do...	App. Dec. 13, 1890.
739	Ben F. Wilkins, jr	1,000	June 18, '91	....do	465.25	Vt....	App. June 13, 1891.
740	Hal P. Willey	900	Dec. 1, '90	July 2, '91	530.69	Ohio.	Promoted.
		1,000	July 3, '91	Nov. 30, '91	410.40		
					951.09		
741	Irvin C. Williams	1,000	June 1, '91	....do	498.20	Pa....	App. June 1, 1891.
742	S.W. Williams	1,000	Dec. 22, '90	Nov. 30, '91	942.97	S. C...	App. Dec. 22, 1890.
743	R. E. Wilson	1,000	Dec. 1, '90	....do	1,000.00	Ga....	
744	R. E. Wines	1,000	....do	....do	1,000.00	Iowa.	
745	John R. Wise	900	Jan. 16, '91	Mar. 8, '91	130.00	Wis..	App. Jan. 16, 1891. Promoted.
		1,000	Mar. 9, '91	Nov. 30, '91	739.69		
					869.69		
746	E. H. Woodford	900	Dec. 1, '90	Mar. 8, '91	243.30	Ky....	Promoted.
		1,000	Mar. 9, '91	Nov. 30, '91	729.69		
					972.99		
747	E. T. Woods	1,000	Feb. 24, '91	....do	766.79	Ohio.	Transferred from Office Chief of Engineers, temporary roll.
748	Fred. A. Wright	1,000	Dec. 1, '90	....do	989.17	Mass.	Absent 4 days without pay.
749	W. L. H. Wright	1,000	Apr. 22, '01	....do	608.13	Tex..	App Apr. 22, 1891.
751	P. H. Allen	900	Oct. 21, '91	....do	100.30	Ala...	App. Oct. 21, 1891.
752	James W. Ames	900	Dec. 1, '90	....do	900.00	La....	
753	Jacob L. Aull	900	Sept. 9, '91	....do	203.00	Ill....	App. Sept. 9, 1891.
754	W. H. Bogan	900	Dec. 1, '90	Nov. 2, '91	831.49	Ky....	Promoted.
		1,000	Nov. 3, '91	Nov. 30, '91	76.09		
					907.58		
755	I. A. Boyd	900	Dec. 1, '90	....do	900.00	Ala...	
756	H. I. Brown	900	Sept. 11, '91	....do	198.11	..do...	App. Sept. 11, 1891.
757	J. S. Busselle	900	Jan. 26, '91	....do	761.70	Ohio.	App. Jan. 26, 1891.
758	Abram L. Cabell	900	Nov. 6, '91	....do	61.14	Ky....	App. Nov. 6, 1891.
759	Daniel D. Cameron	900	Dec. 1, '90	....do	900.00	Cal...	
760	Joseph J. Carpenter	900	Apr. 4, '91	....do	591.76	Ohio.	App. Apr. 4, 1891.
761	Allan N. Cisco	900	Oct. 1, '91	....do	149.20	Ky....	App. Oct. 1, 1891.
762	A. M. Condra	900	Aug. 31, '91	....do	225.05	Oreg.	App. Aug. 31, 1891.
763	Jeremiah Daley	900	Mar. 19, '91	....do	631.70	Pa....	App. Mar. 19, 1891.
764	F. C. Dickerson	900	Dec. 1, '90	....do	900.00	Mass.	
765	W. W. Gibson	900	Oct. 1, '91	....do	149.20	Ala...	App. Oct. 1, 1891.
766	W. S. Gustin	900	Oct. 16, '91	....do	112.53	Ohio.	App. Oct. 16, 1891.
767	R. H. Hardman	900	Jan. 14, '90	Nov. 19, '91	764.77	Ind...	App. Jan. 14, 1891. Promoted.
		1,000	Nov. 20, '91	Nov. 30, '91	29.89		
					794.66		
768	Daniel Higgins	900	Nov. 2, '91	....do	70.92	Utah.	App. Nov. 2, 1891.
769	Firman Housel	900	Jan. 7, '91	....do	809.20	Wis..	App. Jan. 7, 1891.
770	Sam'l W. Houston	900	Aug. 13, '91	....do	256.84	Tex..	App. Aug. 13, 1891.
771	G. W. Humphries	900	Dec. 1, '90	....do	1,000.00	Miss..	
772	Smith E. Hunter	900	Oct. 2, '91	....do	146.77	Oreg.	App. Oct. 2, 1891.
773	D. C. Hutton	900	July 18, '91	....do	332.64	N. C..	App. July 18, 1891.
774	Wm. R. King	900	Dec. 1, '90	....do	900.00	Miss.	
775	John A. Lachman	900	Mar 25, '91	....do	616.70	Ill....	App. Mar. 25, 1891.
776	Marion C. Lamb	900	Dec. 1, '90	Mar. 21, '91	275.80	N. J..	Resigned Mar. 21, 1891. App. Oct 29, 1891.
			Oct. 29, '91	Nov. 30, '91	80.74		
					356.54		
777	Charles Lucas	900	July 27, '91	....do	310.63	Nebr.	App. July 27, 1891

tatement showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

CLASS $1,000 AND COPYISTS—Continued.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.	Remarks.
78	Frank G. Murphy	$900	Dec. 1, '90	Nov. 30, '91	$900.00	Wis	
79	C. C. Parker	900	do	do	900.00	Ark	
80	Frank E. Parks	900	do	do	900.00	Ga	
81	James W. Poe	900	do	do	900.00	N. C.	
82	W. F. Ragan	900	do	do	900.00	Tenn.	
83	J. T. Reynolds	900	do	do	900.00	N. C.	
84	Lucy B. Russell	900	do	do	900.00	Md	
85	Jas H. Schooley	900	do	do	900.00	Mo	
86	B. E. Smith	900	Mar. 19, '91	do	631.70	Ky	App. Mar. 19, 1891.
87	Lawrence Y. Spann	900	Dec. 1, '90	Nov. 17, '91	866.95	Miss	Promoted.
		1,000	Nov. 18, '91	Nov. 30, '91	35.33		
					902.28		
88	D. M. Stuller	900	Feb. 24, '91	do	689.20	Tex	App. Feb. 24, 1891.
89	Frank Tharin	900	Dec. 1, '90	do	900.00	S. C.	
90	Jno. S. Waddington	900	do	Nov. 20, '91	875.51	Wis	Promoted.
		1,000	Nov. 21, '91	Nov. 30, '91	27.17		
					902.68		
91	Ella A. Westgate	900	July 1, '91	do	374.20	Ill	Transferred from the office Chief Signal Officer.
92	William A. Caldwell	900	Nov. 11, '91	do	34.24	W. Va.	App. Nov. 11, 1891. Absent 6 days without pay.
93	William F. Kirby	900	Nov. 13, '91	do	44.02	Mo	App. Nov. 13, 1891.
94	Jesse B. Hamilton	900	Nov. 18, '91	do	31.79	Mich.	App. Nov. 18, 1891.
95	Jno. W. Browning	900	Nov. 27, '91	do	9.78	Ala	App. Nov. 27, 1891.
	Engineer.						
01	Francis Sasse	1,400	Dec. 1, '90	Nov. 30, '91	1,400.00	D. C	
	Skilled Mechanic.						
02	Otto Ulrickson	1,000	Dec. 1, '90	Nov. 30, '91	1,000.00	Vt	
	Assistant Engineer.						
03	James Hess	900	Dec. 1, '90	Nov. 30, '91	900.00	Md	
	Messengers.						
04	John F. Bailey	840	Dec. 1, '90	Nov. 30, '91	840.00	Ind	
05	Jacob Madert	840	do	do	840.00	D. C	
06	James Palmer	840	do	do	840.00	Va	
07	Aaron Stern	840	do	do	840.00	Army.	
08	Frank Wild	840	do	do	840.00	D. C	
	Assistant Messengers.						
09	Thomas Adams	720	Dec. 1, '90	Nov. 30, '91	720.00	D. C	
10	R. T. Caton[1]	660	do	Jan. 9, '91	72.10	N. Y.	Promoted.
		720	Jan. 10, '91	Nov. 30, '91	641.40		
					713.50		
11	Joseph Clements	720	Dec. 1, '90	do	720.00	D. C	
12	John Connell	720	do	do	720.00	do	
13	John Connelly	720	do	do	720.00	do	
14	Michael Connolly	720	do	do	720.00	Army.	
15	Randolph Fortune[1]	660	do	Feb. 15, '91	139.90	D. C	Do.
		720	Feb. 16, '91	Nov. 30, '91	567.40		
					707.30		
16	Thomas Gooley	720	Dec. 1, '90	do	720.00	do	
17	Herman Hage	720	do	do	720.00	do	
18	George Hearns	720	do	do	720.00	do	
19	Michael J. Hewston	720	do	do	720.00	do	
20	D. Killigan	720	do	do	720.00	D. C	

[1]Laborer.

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continue

CLASS $1,000 AND COPYISTS—Continued.

No.	Names.	Annual salary.	Period of service.		Amount received.	Residence when appointed.	Remarks.
			From—	To—			
	Assistant Messengers—Continued.						
821	Fred. Landgraf	$720	Dec. 1, '90	Nov. 30, '91	$720.00	D. C	
822	G. W. Leonard	720	do	do	718.10	Ind	Absent 1 day without pay.
823	Mathew McNamara	720	do	do	720.00	Army	
824	John C. Mack	720	do	do	720.00	Pa	
825	Thos. Morley	720	do	do	720.00	Va	
826	Jas. H. Murphy	720	do	do	720.00	Mass	
827	Matthew Murphy	720	do	do	720.00	D. C	
828	Chas. E. Murray	720	do	do	720.00	do	
829	W. H. O'Neil	720	do	do	676.91	Mass	Absent 22 d without pay
830	Convis Parker[1]	660	Dec. 13, '90	Oct. 5, '91	538.05	Vt	App. Dec. 13, Promoted.
		720	Oct. 6, '91	Nov. 30, '91	109.67		
					647.72		
831	John S. Taylor	720	Dec. 1, '90	do	720.00	Md	
832	Henry Thomas	720	do	do	720.00	D. C	
833	Peter Thomas	720	do	do	720.00	Va	
834	Geo. M. Thompson	720	do	do	720.00	do	
835	Thos. S. Tune	720	do	do	720.00	D. C	
836	Thos. B. Warrick	720	do	do	720.00	Va	
837	R. B. Wilson	720	do	do	720.00	Md	
	Watchmen.						
839	Wm. Barnes	720	Dec. 1, '90	Nov. 30, '91	720.00	Mo	
840	John Crawford	720	do	do	720.00	N. J	
841	Albert Fortune	720	do	do	720.00	D. C	
842	Patrick Hallern	720	do	do	720.00	do	
843	Geo. W. Montgomery.	720	do	do	720.00	Ohio	
	Firemen.						
844	T. J. Edwards	720	Dec. 1, '90	Nov. 30, '91	720.00	D. C	
845	D. E. Padgett	720	do	do	720.00	do	
	Laborers.						
846	Jeremiah Adams	660	Dec. 1, '90	Nov. 30, '91	660.00	Minn	
847	P. B. Barton	660	do	do	660.00	Ala	
848	Henry C. Congdon	660	Oct. 26, '91	do	64.56	Vt	App. Oct. 26.
849	Thomas Flaharty	660	Jan. 14, '91	do	580.60	Pa	App. Jan. 14.
850	George R. Garnett	660	Mar. 5, '91	do	518.90	D. C	App. March 5.
851	Geo. W. Hanson	660	Dec. 1, '90	do	660.00	Ga	
852	Thomas H. Hart	660	do	do	660.00	Va	
853	Alex. S. Hooe	660	do	do	658.20	Wis	Absent 1 day without pay.
854	J. M. Jackson, jr	660	do	do	660.00	Ohio	
855	H. C. James	660	May 13, '91	do	363.25	D. C	Transferred office Secr of War.
856	Felix B. Logan	660	Oct. 7, '91	do	98.64	N. C	App. Oct. 7.
857	Cornelius Morgan	660	June 16, '91	do	301.60	Va	Transferred office Sur General.
858	H. C. Peck	660	Dec. 1, '90	do	660.00	N. Y	
859	Alexander Sembly	660	do	do	660.00	Md	
860	Henry Thompson	660	do	do	660.00	D. C	
861	Frank M. Welch	660	June 8, '91	do	316.11	Conn	App. June 8,
	Messenger Boy.						
862	Edward Burrell	360	Dec. 1, '90	do	360.00	Va	
	Superintendent Building.						
863	W. E. Covert	250	do	do	250.00	Ky	

[1] Laborer.

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

CASUALTIES.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.	Remarks.
	CLASS 2.						
1	T. S. Buchanan	$1,400	Dec. 1, '90	Jan. 7, '91	$145.12	Army	Died Jan. 7, 1891.
2	J. T. Newton	1,400	....do	Mar. 26, '91	448.91	Ga	Resigned Mar. 26, 1891.
	CLASS 1.						
3	F. W. R. Braddock	1,200	Dec. 1, '90	May 17, '91	556.04	Ohio	Resigned May 17, 1891.
4	E. J. Brookings	1,200	....do	Jan. 12, '91	141.10	Me	Resigned Jan. 12, 1891.
5	John P. Clum	1,200	....do	Jan. 16, '91	154.43	Cal	Resigned Jan. 16, 1891.
6	John R. Dickson	1,200	....de	Dec. 31, '90	101.10	D. C	Resigned Dec. 31, 1890.
7	John W. Fenton	1,200	....do	Apr. 15, '91	450.55	N. Y	Died Apr. 15, 1891.
8	William L. Glass	1,200	....do	....do	450.55	Ill	Do.
9	Charles L. Grannis, jr.	1,200	....do	Mar. 25, '91	381.13	Minn	Resigned Mar. 25, 1891.
10	Thorné D. Hallett	1,200	....do	May 31, '91	500.00	N. J	Absent 31 days without pay. Resigned May 31, 1891.
11	G. H. Hammond	1,200	....do	July 1, '91	701.10	Minn	Transferred to office of Quartermaster-General July 1, 1891.
12	Lewis C. Herrick	1,200	....do	Nov. 17, '91	1,157.63	Ill	Died Nov. 17, 1891.
13	Austin Holcomb	1,200	....do	Oct. 7, '91	1,001.10	Ga	Absent 7 days without pay. Resigned Oct. 7 1891.
14	T. R. Holmes	1,200	....do	June 9, '91	631.87	S. C	Died June 9, 1891.
15	Rudolph Johnson	1,200	....do	Aug. 5, '91	818.50	D. C	Resigned Aug. 5, 1891.
16	J. J. Kearney	1,200	....do	Jan. 22, '91	174.43	Ill	Died Jan. 22, 1891.
17	Geo. E. Kelley	1,200	....do	Apr. 24, '91	480.22	Mass	Discharged Apr. 24, 1891.
18	Susan M. Landon	1,200	May 18, '91	July 1, '91	145.05	Vt	Appointed May 18, 1891. Transferred to office of Quartermaster-General July 1, 1891.
19	W. S. McElroy	1,200	Dec. 1, '90	Dec. 31, '90	101.10	La	Resigned Dec. 31, 1890.
20	J. K. McKeever	1,200	....do	Apr. 6, '91	420.88	Pa	Died April 6, 1891.
21	O. M. McPherson	[1]1,000	Jan. 5, '91	Aug. 24, '91	618.88	Kans.	Appointed Jan. 5, 1891. Promoted Aug. 24, 1891. Resigned Nov. 19, 1891.
		1,200	Aug. 25, '91	Nov. 19, '91	283.69		
					902.57		
22	N. B. Milliken	1,200	Dec. 1, '90	Feb. 12, '91	244.40	Me	Resigned Feb. 12, 1891.
23	Henry Morris	1,200	....do	Sept. 3, '91	913.06	Del	Died Sept. 3, 1891.
24	J. G. Nokes	1,200	....do	Mar. 19, '91	361.13	D. C	Died Mar. 19, 1891.
25	T. M. Pancoast	1,200	....do	June 30, '91	701.10	Ohio	Resigned June 30, 1891.
26	Chas. L. Patten	1,200	....do	Mar. 31, '91	401.10	Me	Resigned Mar. 31, 1891.
27	G. F. Pollock	1,200	....do	Jan. 31, '91	204.40	Ohio	Resigned Jan. 31, 1891.
28	A. W. Prather	1,200	....do	Nov. 19, '91	1,164.16	Ind	Died Nov. 19, 1891.
29	W. H. H. Price	1,200	....do	Mar. 1, '91	301.13	Kans.	Resigned Mar. 1, 1891.
30	L. O. Robbins	1,200	....do	Apr. 30, '91	500.00	N. Y	Resigned Apr. 30, 1891.
31	E. G. Runyan	1,200	....do	Dec. 15, '90	45.65	Mich	Resigned Dec. 15, 1891.
32	Robt. S. Shelton	[1]1,000	....do	Mar. 8, '91	270.32	Mo	Promoted. Resigned Sept. 30, 1891.
		1,200	Mar. 9, 91	Sept. 30, '91	676.67		
					946.99		
33	Jul Stommel	1,200	Dec. 1, '90	Apr. 16, '91	447.32	N. J	Absent 2 days without pay. Died Apr. 16, 1891.

[1]Class $1,000.

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

CASUALTIES—Continued.

No.	Names.	Annual salary.	Period of service.		Amount received.	Residence when appointed.	Remarks.
			From—	To—			
	CLASS 1—Continued.						
34	E. H. Tabler	$1,200	Dec. 1, '90	Mar. 5, '91	$307.94	D. C.	Discharged Mar. 5, 1891.
35	A. V. Taylor	1,200	....do	Oct. 15, '91	1,050.01	Utah	Resigned Oct. 15, 1891.
36	Walter I. Taylor	1,200	....do	Sept. 26, '91	886.98	La	Absent 31 days without pay. Resigned Sept. 26, 1891.
37	S. W. Tucker	1,200	....do	Sept. 30, '91	1,001.10	Pa.	Resigned Sept. 30, 1891.
38	Oscar W. White	1,200	....do	May 5, '91	417.58	Pa.	Absent 30 days without pay. Resigned May 5, 1891.
39	Andrew Wilson	1,200	....do	Nov. 4, '91	1 115.24	Kans.	Resigned Nov. 4, 1891.
40	D. K. Wright	1,200	....do	Sept 30, '91	1,001.10	Iowa	Resigned Sept. 30, 1891.
	CLASS $1.000.						
41	W. J. Alsop	1,000	....do	Oct. 31, '91	961.94	Ala.	Absent 7 days without pay. Resigned Oct. 31, 1891.
42	John M. Biddle	1,000	....do	Aug. 17, '91	714.60	W. Va	Resigned Aug. 17, 1891.
43	Geo. W. Campbell	1,000	....do	Mar. 16, '91	292.54	Ga	Dropped: not permanently appointed.
44	M. O. Chance	1,000	....do	Aug. 13, '91	561.13	Ill	Resigned Aug. 13, 1891.
45	Will O. Gilbert	1,000	....do	July 9, '91	608.66	Mich	Resigned July 9, 1891.
46	Joseph Hannan	1,000	Apr. 27, '91	Nov. 15, '91	523.70	Cal.	App. April 27, 1891. Absent 11 days without pay. Resigned Nov. 15, 1891.
47	R. B. Hodges	1,000	Dec. 1, '90	Mar. 29, '91	328.66	Ga.	Dropped: not permanently appointed.
48	Thos. W. Jones, jr	1,000	....do	Feb. 10, '91	198.08	S. C.	Resigned Feb. 10, 1891.
49	Frank E. Larimer	1,000	....do	Mar. 29, '91	328.66	Tex.	Died March 29, 1891.
50	T. H. Leary	1,000	....do	June 15, '91	543.01	N. C.	Resigned June 15, 1891.
51	E. P. Lewis	1,000	July 10, '91	Oct. 12, '91	258.91	..do...	App. July 10, 1891. Resigned Oct. 12, 1891.
52	W. E. Mowrer	1,000	Dec. 1, '90	Apr. 12, '91	390.09	Mo	Resigned April 21, 1891.
53	Robt. E. Parker	1,000	Feb. 1, '91	June 24, '91	394.69	Cal.	App. Feb. 1, 1891. Transferred to office Secretary of War.
54	Louis W. Reilly	1,000	Mar. 25, '91	Mar. 31, '91	19.44	Ohio	App. Mar. 25, 1891. Resigned Mar. 31, 1891.
55	E. T. Richardson	1,000	Dec. 1, '90	Oct. 9, '91	858.56	Miss.	Resigned Oct. 9, 1891.
56	John J. Stearns	1,000	....do	July 14, '91	622.24	Mass.	Discharged July 14, 1891.
57	Joseph Stewart	1,000	....do	May 1, '91	419.55	Mo	Resigned May 1, 1891.
58	C. F. Thompson	1,000	....do	Oct. 26, '91	904.85	Mass.	Resigned Oct. 26, 1891.
59	John S. Wheatly	1,000	May 28, '91	July 3, '91	98.82	Ky	App. May 28, 1891. Resigned July 3, 1891.
60	Henry K. White	1,000	Mar. 28, '91	Oct. 15, '91	551.87	Wis.	App. Mar. 28, 1891. Resigned Oct. 15, 1891.
61	Clement Williams	1,000	Dec. 1, '90	Feb. 22 91	231.41	La	Died Feb. 22, 1891.
62	John C. Winn	1,000	....do	Jan. 5, 91	98.09	D. C.	Died Jan. 5, 1891.

t showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

CASUALTIES—Continued.

Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.	Remarks.
Copyists.						
ey J Clark	$900	July 13, '91	July 13, '91	.....	Ala...	App. July 13, 1891. Absent 1 day without pay. Resigned July 13, 1891.
. Rowland	900	Dec. 1, '90	Oct. 24, '91	$716.53	Ohio .	Absent 24 days without pay. Discharged Oct. 24, 1891.
tant Messengers.						
H. Arrington	720	Dec. 1, '90	Dec. 31, '90	60.60	N. C..	Discharged Dec. 31, 1890.
ael Bowles	720	....do	Dec. 6, '90	11 74	Pa ...	Died Dec 6, 1890.
Pollock	[1]600	....do	Dec. 8, '90	12.56	Ill....	Promoted Dec. 8, 1890. Absent 10 days without pay. Discharged Oct. 1, 1891.
	720	Dec. 9, '90	Oct. 1, '91	584.22		
				596.78		
F. Reinhard	720	Dec. 1, '90	Feb. 15, '91	152.60	Ohio .	Resigned Feb. 15, 1891.
Laborers.						
nel Jones	660	Dec. 1, '90	June 6, '91	342.08	Va ...	Discharged June 6, 1891.
les E. Minor	[2]250	....do	Dec. 8, '90	6,85	..do ..	Promoted Dec. 8, 1890. Resigned Oct. 25, 1891.
	660	Dec. 9, '90	Oct. 25, '91	582.89		
				589.74		
Rankin	660	Dec. 1, '90	June 16, '91	358.40	Tenn.	Transferred to office of Surgeon-General June 16, 1891.
l Swayze	660	Jan. 27, '91	Apr. 26, '91	159.08	N. J ..	Appointed Jan. 27, 1891, for 3 months. Absent 3 days without pay. Dropped April 26, 1891.

[1] Laborer. [2] Messenger boy.

t showing the names, compensation, etc., of clerks, messengers, assistant mes-, and watchmen employed in the office of the Adjutant-General of the Army December 1, 1890, to November 30, 1891.

Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
CLASS B.					
Chief Clerk.					
ael P. Thian	$2,000	Dec. 1, 1890	Nov. 30, 1891	$2,000.00	New York.
CLASS 4.					
Bock	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	Dist. of Columbia.
y S. Brinkerhoff	1,800	....do	....do	1,800.00	New York.
les Brown	1,800	....do	....do	1,800.00	Do.
amin Engel	1,800	....do	....do	1,800.00	Dist. of Columbia.
aniel Hershler	1,800	....do	....do	1,800.00	Illinois.
d E. Holmes	1,800	....do	....do	1,800.00	West Virginia.
k Jones	1,800	....do	....do	1,800.00	New York.
r W. Longan	1,800	....do	....do	1,800.00	Pennsylvania.
illiam Palmer	1,800	....do	....do	1,800.00	Minnesota.
am N. Peck	1,800	....do	....do	1,800.00	New York.
D. Sabine	1,800	....do	....do	1,800.00	Massachusetts.
les W. Shelton	1,800	....do	....do	1,800.00	Do.
erick H. Stafford	1,800	....do	....do	1,800.00	New York

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continued

No.	Names.	Annual salary.	Period of service.		Amount received.	Residence when appointed.
			From—	To—		
	CLASS 4—Continued.					
14	Frederick T. Wilson	$1,800	Dec. 1, 1890	Nov. 1, 1891	$1,800.00	Massachusetts.
15	Henry C. Wood	1,800	do	do	1,800.00	Pennsylvania.
	CLASS 3.					
1	Jeremiah C. Allen	1,600	Dec. 1, 1890	Nov. 30, 1891	1,600.00	Wisconsin.
2	Sanford Bradbury	1,600	do	do	1,600.00	New York.
3	Charles Brandt	1,600	do	do	1,600.00	Maryland.
4	Gustavus A. Brandt	1,600	do	do	1,600.00	Dist. of Columbia
5	William Bremer	1,600	do	do	1,600.00	Indiana.
6	Laurence J. Bryan	1,600	do	do	1,600.00	New York.
7	John Cameron	1,600	do	do	1,600.00	Pennsylvania.
8	Frances B. Heitman	1,600	do	do	1,600.00	Ohio.
9	Charles F. Keefer	1,600	do	do	1,600.00	Pennsylvania.
10	Norval W. King	1,600	do	do	1,600.00	Dist. of Columbia
11	Harvey A. Kohr	1,600	do	do	1,600.00	Pennsylvania.
12	Jesse W. Lee, jr	1,600	do	do	1,600.00	Maryland.
13	John McCarthy	1,600	do	do	1,600.00	Dist. of Columbia
14	George W. Nagle	1,600	do	do	1,600.00	Maryland.
15	Thomas B. Nolan	1,600	do	do	1,600.00	Pennsylvania.
16	Thomas R. Senior	1,600	do	do	1,600.00	Do.
17	Thomas Y. Yeates	1,600	do	do	1,600.00	Dist. of Columbia
	CLASS 2.					
1	Edward H. Atkins	1,400	Dec. 1 1890	Nov. 30, 1891	1,400.00	Connecticut.
2	George V. Balch	1,400	do	do	1,400.00	Dist. of Columbia
3	Albert F. Bayard	1,400	do	do	1,400.00	New York.
4	Thomas Bevans	1,400	do	do	1,400.00	Missouri.
5	Morris Cohen	1,400	do	do	1,400.00	New York.
6	Edmond Cotterill	1,400	do	do	1,400.00	Dist. of Columbia
7	Florence Donohue	1,400	do	do	1,400.00	New York.
8	George B. French	1,400	do	do	1,400.00	Massachusetts.
9	Frank A. Hopper	1,400	do	do	1,400.00	Pennsylvania.
10	Thomas Haslam	1,400	do	do	1,400.00	Do.
11	Daniel E. Knapp	1,400	do	do	1,400.00	New York.
12	Martin B. Lichty	1,400	do	do	1,400.00	Dist. of Columbia
13	George W. McKee	1,400	do	do	1,400.00	Pennsylvania.
14	Charles E. Persons	1,400	do	do	1,400.00	Vermont.
15	Henry J. Playter	1,400	do	do	1,400.00	Iowa.
16	St. George R. Raby	1,400	do	do	1,400.00	New York.
17	William H. B. Ramsey	1,400	do	do	1,400.00	Pennsylvania.
18	Charles Smith	1,400	do	do	1,400.00	Dist. of Columbia
19	Frederick H. Smith	1,400	do	do	1,400.00	Wisconsin.
20	William G. Spottswood	1,400	do	do	1,400.00	Pennsylvania.
21	Lewis Williams	1,400	do	do	1,400.00	Dist. of Columbia
	CLASS 1.					
1	Hanson F. Barnard	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Dist. of Columbia
2	Ulrey J. Biller	1,200	do	do	1,200.00	Tennessee.
3	Daniel D. Brennan	1,200	do	do	1,200.00	New York.
4	Thomas G. Carmick	1,200	do	do	1,200.00	California.
5	George H. Chadwick	1,200	do	do	1,200.00	Alabama.
6	John S. Charleson	1,200	do	do	1,200.00	Ohio.
7	Leonard C. Chew	1,200	do	do	1,200.00	Dist. of Columbia.
8	Daniel Clarke	1,200	do	do	1,200.00	Maryland.
9	Arthur E. Clifford	1,200	do	do	1,200.00	New Hampshire.
10	Fred. O. Congdon	1,200	do	do	1,200.00	New York.
11	Charles F. Crosby	1,200	do	do	1,200.00	Virginia.
12	Richard Cullen	1,200	do	do	1,200.00	Kansas.
13	Valentine H. Cuming	1,200	do	do	1,200.00	Dist. of Columbia
14	Edward W. Davis	1,200	do	do	1,200.00	Do.
15	E. Warren Day	1,200	do	do	1,200.00	New York.
16	Asaph Dodge	1,200	do	do	1,200.00	Do.
17	Edward Duff	1,200	do	do	1,200.00	Pennsylvania.
18	Charles S. Elliott	1,200	do	do	1,200.00	Kansas.
19	Charles Erwin	1,200	do	do	1,200.00	New York.
20	Edward B. Eynon	1,200	do	do	1,200.00	Pennsylvania.
21	John B. Foote[1]	1,200	Apr. 14, 1891	do	756.04	New York.
22	Elmer A. Forbes	1,200	Dec. 1, 1890	do	1,200.00	Kansas.
23	Benjamin C. Gallup	1,200	do	do	1,200.00	Oregon.
24	Charles E. Gannon	1,200	do	do	1,200.00	Massachusetts.
25	Charles W. Geddes	1,200	do	do	1,200.00	South Carolina.
26	Horatio G. Gibson, jr.[2]	1,200	do	do	868.13	Kentucky.
27	Frederick W. Grossart	1,200	do	do	1,200.00	California.

[1] Appointed.

[2] Absent 71 days without pay.

t showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
ıss 1—Continued.					
wyer Hardesty[1]	$1,000 1,200	Dec. 1, 1890 Feb. 16, 1891	Feb. 15, 1891 Nov. 30, 1891	$211.97 945.53	West Virginia.
				1,157.50	
r Herman	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Louisiana.
›h H. C. Hollins	1,200	....do	....do	1,200.00	Dist. of Columbia.
›s G. Hudson	1,200	....do	....do	1,200.00	Texas.
er I. Hunter	1,200	....do	....do	1,200.00	Dist. of Columbia.
ael Kelly	1,200	....do	....do	1,200.00	Do.
e S. Lawton	1,200	....do	....do	1,200.00	Do.
am E. Leonard	1,200	....do	....do	1,200.00	Iowa.
beth F. Long	1,200	....do	....do	1,200.00	Dist. of Columbia.
C. Lyons	1,200	....do	....do	1,200.00	Ohio.
les M. McCann	1,200	....do	....do	1,200.00	Florida.
les F. McDermott	1,200	....do	....do	1,200.00	Dist. of Columbia.
L. McGee	1,200	....do	....do	1,200.00	West Virginia.
s L. McGlone[2]	1,200	....do	....do	1,160.44	Virginia.
ıas McKernan	1,200	....do	....do	1,200.00	Dist. of Columbia.
erick O. Mack	1,200	....do	....do	1,200.00	Do.
aniel M. Macrae	1,200	....do	....do	1,200.00	New Mexico.
ıas Maloney	1,200	....do	....do	1,200.00	Dist. of Columbia.
rt H. Martin	1,200	....do	....do	1,200.00	Florida.
T. Masters	1,200	....do	....do	1,200.00	New York.
avus B. Maynadier	1,200	....do	....do	1,200.00	Dist. of Columbia.
ne M. Merrick[3]	1,200	....do	....do	1,196.77	New York.
›h R. Mickle	1,200	....do	....do	1,200.00	Pennsylvania.
A. Moran	1,200	....do	....do	1,200.00	Texas.
Moriarty[4]	1,200	May 1, 1891	....do	700.00	Ohio.
am Mulhall	1,200	Dec. 1, 1890	....do	1,200.00	Maryland.
›r Nelson[5]	1,200	....do	....do	1,200.00	Michigan.
ın O'Connor	1,200	....do	....do	1,200.00	Dist. of Columbia.
ard O'Dowd	1,200	....do	....do	1,200.00	Virginia.
es H. Ourand	1,200	....do	....do	1,200.00	Louisiana.
k W. Paige	1,200	....do	....do	1,200.00	Dist. of Columbia.
›n C. Patterson	1,200	....do	....do	1,200.00	Tennessee.
D. Patterson	1,200	....do	....do	1,200.00	Michigan.
n H. Pearson	1,200	....do	....do	1,200.00	West Virginia.
es O. Pierson	1,200	....do	....do	1,200.00	New York.
am T. Priddy	1,200	....do	....do	1,200.00	Virginia.
ge W. Riggles	1,200	....do	....do	1,200.00	Dist. of Columbia.
p R. R. Sattes	1,200	....do	....do	1,200.00	Ohio.
y Schulz	1,200	....do	....do	1,200.00	Dist. of Columbia.
am M. Sefton	1,200	....do	....do	1,200.00	Do.
s S. Smith[1]	1,000 1,200	....do Aug. 5, 1891	Aug. 4, 1891 Nov. 30, 1891	679.27 384.74	Georgia.
				1,064.01	
›rd W. Smith	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Michigan.
am M. Smith	1,200	....do	....do	1,200.00	Pennsylvania.
›h Smolinski	1,200	....do	....do	1,200.00	Dist. of Columbia.
es Spencer	1,200	....do	....do	1,200.00	Pennsylvania.
es M. Staley	1,200	....do	....do	1,200.00	Illinois.
ın L. Stowell	1,200	....do	....do	1,200.00	Kansas.
›n S. Sturges	1,200	....do	....do	1,200.00	New York.
S. Thompson	1,200	....do	....do	1,200.00	California.
y Turnbull	1,200	....do	....do	1,200.00	Dist. of Columbia.
es L. Walker	1,200	....do	....do	1,200.00	New York.
p H. Weber	1,200	....do	....do	1,200.00	Dist. of Columbia.
ır Wiecker	1,200	....do	....do	1,200.00	Do.
n Williamson[1]	1,200	....do	....do	1,200.00	Arkansas.
ge A. Young	1,200	....do	....do	1,200.00	Dist. of Columbia.
y A. Hayward[6]	1,200	....do	Apr. 9, 1891	430.77	Minnesota.
st B. Holcombe[6]	1,200	....do	Feb. 15, 1891	254.40	New York.
Mitchell[7]	1,200	....do	Aug. 4, 1891	815.24	Dist. of Columbia.
S. Terry[7]	1,200	....do	Apr. 25, 1891	483.52	Illinois.
CLASS C.					
G. Baker	1,200	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Pennsylvania.
C. Buck[8]	1,000	Aug. 17, 1891	....do	288.16	New Hampshire.
ıen A. Cairns[8]	1,000	Dec. 1, 1890	....do	1,000.00	Pennsylvania.
ıan H. Camp[8]	1,000	Sept. 17, 1891	....do		Idaho.
es Forbes	1,000	Dec. 1, 1890	....do	1,000.00	New York.

moted.
ent 12 days without pay.
ent 1 day without pay.
nsferred from office of Chief Signal Officer.
[5] Appointed.
[6] Resigned.
[7] Died.
[8] Appointed; no payment made

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS C—Continued.					
6	Horace D. Goodale[1]	$1,000	Dec. 27, 1890	Nov. 30, 1891	$929.39	New York.
7	Wm. E. Horton[1]	1,000	Mar. 13, 1891	....do	718.58	Rhode Island.
8	Sydney R. Jacobs	1,000	Dec. 1, 1890	....do	1,000.00	Wisconsin
9	Wm. A. Scott	1,000	....do	....do	1,000.00	Dist. of Columbia
	Chas. E. Brunthaver[2]	1,200	....do	June 30, 1891	701.10	Ohio.
		1,000	July 1, 1891	July 31, 1891	84.20	
					785.30	
	Walter J. Perry[3]	1,000	Dec. 9, 1890	June 8, 1891	502.08	Massachusetts.
	Messengers.					
1	Stephen Kane	840	Dec. 1, 1890	Nov. 30, 1891	840.00	Dist. of Columbia.
2	James McGilton	840	....do	....do	840.00	Do.
3	Ira G. Scott	840	....do	....do	840.00	California.
4	Lindsey Winslow	840	....do	....do	840.00	Virginia.
	Assistant messengers.					
1	Joseph Allen	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Dist. of Columbia.
2	James F. Cullen	720	....do	....do	720.00	Tennessee.
3	Charles B. Davis	720	....do	....do	720.00	Dist. of Columbia.
4	William Gill	720	....do	....do	720.00	Do.
5	Septemius T. Graham	720	....do	....do	720.00	Kansas.
6	August Grimm	720	....do	....do	720.00	Dist. of Columbia.
7	Benjamin Jacobs	720	....do	....do	720.00	Do.
8	Charles Kober	720	....do	....do	720.00	Illinois.
9	Patrick Larkin	720	....do	....do	720.00	Dist. of Columbia.
10	John T. McKeon	720	....do	....do	720.00	Do.
11	Lewis J. Melchior	720	....do	....do	720.00	Maryland.
12	Andrew Mills	720	....do	....do	720.00	Dist. of Columbia.
13	Alexander Oglesby	720	....do	....do	720.00	Virginia.
14	Edwin D. Perkins	720	....do	....do	720.00	Dist. of Columbia.
15	William H. Pike	720	....do	....do	720.00	Massachusetts.
16	George R. Rowan	720	....do	....do	720.00	New York.
17	James H. Smith	720	....do	....do	720.00	Virginia.
18	Reuben M. Whitney	720	....do	....do	720.00	Maryland.
19	John Widmire	720	....do	....do	720.00	Dist. of Columbia.
20	William W. Withington	720	....do	....do	720.00	Pennsylvania.
	Watchmen.					
1	John Anderson	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Pennsylvania.
2	Michael Cavanagh	720	....do	....do	720.00	New York.
3	Morgan McInerney	720	....do	....do	720.00	Dist. of Columbia.

[1] Appointed. [2] Reduced and appointment expired. [3] Probationary appointment expired.

Statement showing the names, compensation, etc., of clerks, messengers, laborers, and watchmen employed in the office of the Inspector-General from December 1, 1890, to November 30, 1891.

No.	Name.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS 4.					
1	Warren H. Orcutt	$1,800.00	Dec. 1, 1890	Nov. 30, 1891	$1,800.00	Army.
	CLASS 3.					
2	Otis B. Goodall	1,600.00	Dec. 1, 1890	Nov. 30, 1891	1,600.00	New Hampshire.
	CLASS 2.					
3	A. C. Quisenberry	1,400.00	Dec. 1, 1890	Nov. 30, 1891	1,400.00	Kentucky.
4	B. Bunnemeyer	1,400.00	....do	....do	1,400.00	Army.
	CLASS 1.					
5	J. D. Parker[1]	1,200.00	July 1, 1891	Nov. 30, 1891	498.90	Virginia.
6	C. F. Dickens[2]	1,200.00	....do	....do	498.90	Pennsylvania.
	Assistant Messenger.					
7	John Connolly	720.00	Dec. 1, 1890	Nov. 30, 1891	720.00	Army.

[1] Transferred from the office of the Chief Signal Officer, July 1, 1891.
[2] Transferred from the office of the Chief Signal Officer, July 1, 1891, and promoted to Class 1.

Statement showing the names, compensation, etc., of clerks, copyists, and messengers employed in the Judge-Advocate-General's Office from December 1, 1890, to November 30, 1891.

No.	Names.	Annual salary.	Period of service.		Amount received.	Residence when appointed.
			From—	To—		
	Chief Clerk.					
1	J. N. Morrison	$2,000	Dec. 1, 1890	Nov. 30, 1891	$2,000.00	Missouri.
	CLASS 3.					
2	Francis G. Saxton	1,600	Dec. 1, 1890	Nov. 30, 1891	1,600.00	Illinois.
3	L. W. Call	1,600	....do	....do	1,600.00	Kansas.
	CLASS 2.					
4	John P. Simonton	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	Indiana.
	CLASS 1.					
5	Thomas Sprague	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Indiana.
6	Cyrus Chambers	1,200	....do	....do	1,200.00	Iowa.
7	John J. Snodgrass	1,200	....do	....do	1,200.00	Pennsylvania.
8	Thomas B. Allen	1,200	....do	....do	1,200.00	Missouri.
	CLASS C.					
9	Harry Chapman	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	New York.
	CLASS D.					
10	William H. Dobson	900	Dec. 1, 1890	Nov. 30, 1891	900.00	Pennsylvania.
	Messenger.					
11	John Tennyson	840	Dec. 1, 1890	Nov. 30, 1891	840.00	Dist. of Columbia.
	Assistant messengers.					
12	William B. Yeatman[1]	720	Dec. 1, 1890	Jan. 31, 1891	112.60	Dist. of Columbia.
13	Charles H. Wood[2]	720	Feb. 1, 1891	Nov. 30, 1891	597.40	Do.

[1] Resigned Jan. 31, 1891. [2] Appointed Feb. 1, 1891.

Statement showing the names of clerks and others employed in the office of the Quartermaster-General, U. S. Army, from December 1, 1890, to November 30, 1891.

No.	Name.	Annual salary.	Period of service.		Amount received.	Residence when appointed.
			From—	To—		
	CLASS B.					
	Chief Clerk.					
1	J. Z. Dare	$2,000	Dec. 1, 1890	Nov. 30, 1891	$2,000.00	Pennsylvania.
	CLASS 4.					
2	George K. Finckel	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	Dist. of Columbia.
3	Alex. W. Lattimore	1,800	....do	....do	1,800.00	Indiana.
4	Charles Ebert	1,800	....do	....do	1,800.00	New York.
5	Albert Gaines	1,800	....do	....do	1,800.00	Maine.
6	Fred. A. Gee	1,800	....do	....do	1,800.00	New York.
7	George E. Davis	1,800	....do	....do	1,800.00	Pennsylvania.
8	Henry D. Saxton	1,800	....do	....do	1,800.00	Massachusetts.
9	Francis M. Schreiner	1,800	....do	....do	1,800.00	Dist. of Columbia.
10	Robert Armour	1,800	....do	....do	1,800.00	New York.
11	George W. Callahan	1,800	....do	....do	1,800.00	Pennsylvania.
12	John H. Hood	1,800	....do	....do	1,800.00	Dist. of Columbia.
13	H. H. Parmenter	1,800	....do	....do	1,800.00	Massachusetts.
14	Abner Y. Leech[1]	1,800	....do	....do	1,683.20	Dist. of Columbia
15	Thomas W. Webster[2]	1,800	....do	June 18, 1891	992.31	Maryland.
	CLASS 3.					
16	William H. Hodges	1,600	Dec. 1, 1890	Nov. 30, 1891	1,600.00	New Jersey
17	George Marsh	1,600	....do	....do	1,600.00	Illinois.

[1] Promoted from class 3 July 1, 1891. [2] Died June 18, 1891.

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continu

No.	Names.	Annual salary.	Period of service.		Amount received.	Residence wh appointed.
			From—	To—		
	CLASS 3—Continued.					
18	John M. Grahame	$1,600	Dec. 1, 1890	Nov. 30, 1891	$1,600.00	Maryland.
19	Henry W. Smith	1,600	do	do	1,600.00	New York.
20	Henry B. Fernald	1,600	do	do	1,600.00	Massachusetts
21	Henry P. Files	1,600	do	do	1,600.00	Dist. of Colum
22	John H. Pickell	1,600	do	do	1,600.00	New York.
23	Alex. H. Morrison	1,600	do	do	1,600.00	Missouri.
24	Lucius F. Randolph	1,600	do	do	1,600.00	New York.
25	Frank S. Altemus	1,600	do	do	1,600.00	Pennsylvania
26	Robert M. Barnitz[1]	1,600	do	do	1,483.10	New York.
	CLASS 2.					
27	Benjamin A. Farless	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	New York.
28	Noah H. Martin	1,400	do	do	1,400.00	Pennsylvania
29	William H. Burnett[2]	1,400	do	do	1,242.19	Iowa.
30	James Williamson	1,400	do	do	1,400.00	Pennsylvania
31	Samuel M. Thatcher	1,400	do	do	1,400.00	Do.
32	John B. Pearce	1,400	do	do	1,400.00	Ohio.
33	Allis W. Ogden	1,400	do	do	1,400.00	New York.
34	Edward Flagg	1,400	do	do	1,400.00	Massachusetts
35	Thomas Montgomery	1,400	do	do	1,400.00	New York.
36	Isaac N. Thornburg	1,400	do	do	1,400.00	West Virginia
37	Frank H. Evans	1,400	do	do	1,400.00	New Hampshi
38	John D. Creighton	1,400	do	do	1,400.00	Massachusetts
39	Charles W. Hills	1,400	do	do	1,400.00	Ohio.
40	Francis McLean	1,400	do	do	1,400.00	New York.
41	E. D. Sedgwick, Miss	1,400	do	do	1,400.00	Connecticut.
42	Edward C. Townsend[3]	1,400	do	do	1,293.44	New York.
43	William Ryan	1,400	do	do	1,400.00	Nebraska.
44	James F. Dooley	1,400	do	do	1,400.00	Dist. of Colum
45	Frank O. Ball	1,400	do	do	1,400.00	Wisconsin.
46	John A. Botts	1,400	do	do	1,400.00	Dist. of Colum
47	Frank B. Holden	1,400	do	do	1,400.00	Maine.
48	Lewis B. Parker	1,400	do	do	1,400.00	South Carolin
49	Robert E. Fugitt[4]	1,400	do	do	1,298.04	Dist. of Colum
50	John Berry[5]	1,400	do	do	1,283.20	Do.
51	Ernest Hawkins[6]	1,400	do	May 31, 1891	702.50	Tennessee.
	CLASS 1.					
52	L. F. Fix	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Ohio.
53	James S. Franklin	1,200	do	do	1,200.00	Pennsylvania.
54	James McMahon	1,200	do	do	1,200.00	New York.
55	D. W. Cleaver	1,200	do	do	1,200.00	Iowa.
56	William B. Johnson	1,200	do	do	1,200.00	Ohio.
57	Lizzie A. Richardson, Miss[7]	1,200	do	do	1,178.82	New Hampshir
58	Emily Ring, Mrs	1,200	do	do	1,200.00	New York.
59	Walter S. McFarlan[8]	1,200	do	do	1,159.62	Dist. of Columl
60	E. T. Cowperthwaite, Miss[9]	1,200	do	do	1,193.47	Pennsylvania.
61	Ida Allen, Miss	1,200	do	do	1,200.00	Dist. of Columl
62	Caroline A. Sherman, Miss	1,200	do	do	1,200.00	Virginia.
63	E. S. Gurley, Mrs	1,200	do	do	1,200.00	Iowa.
64	Mary L. Davidson, Miss	1,200	do	do	1,200.00	Maryland.
65	J. J. Pratt	1,200	do	do	1,200.00	New York.
66	Helen J. Paulding, Mrs	1,200	do	do	1,200.00	Do.
67	Sarah L. Myers, Mrs	1,200	do	do	1,200.00	Pennsylvania.
68	Wm. F. McBride	1,200	do	do	1,200.00	Do.
69	F. A. Von Tagen	1,200	do	do	1,200.00	Minnesota.
70	Hiram H. Martin	1,200	do	do	1,200.00	Illinois.
71	John M. McFarland	1,200	do	do	1,200.00	Dist. of Columl
72	Howard L. Johnson[10]	1,200	do	do	1,190.22	Pennsylvania.
73	William Geddes	1,200	do	do	1,200.00	Indiana.
74	Isaac J. Jacquette	1,200	do	do	1,200.00	Pennsylvania.
75	Willian H. Fuller[11]	1,200	do	do	1,190.71	Maryland.
76	Susan C. Roy, Miss	1,200	do	do	1,200.00	Dist. of Columl
77	Emma G. Brewer, Mrs	1,200	do	do	1,200.00	Kansas.
78	Annie G. Davis, Miss	1,200	do	do	1,200.00	Dist. of Columl
79	Victoria J. LeCompte, Miss	1,200	do	do	1,200.00	Do.
80	Mary L. Mauger, Miss	1,200	do	do	1,200.00	Pennsylvania.
81	Eliza C. Bull, Miss	1,200	do	do	1,200.00	Michigan.
82	Julia P. Humphrey, Miss	1,200	do	do	1,200.00	Vermont.

[1] Promoted from class 2, July 1, 1891.
[2] Absent 41 days, 3 hours, and 30 minutes, without pay.
[3] Absent 28 days without pay.
[4] Promoted from class 1 June 4, 1891.
[5] Promoted from class 1 July 1, 1891.
[6] Resigned May 31, 1891.
[7] Absent 6 days, 3 hours, and 30 minutes, w out pay.
[8] Absent 13 days without pay.
[9] Absent 2 days without pay.
[10] Absent 3 days without pay.
[11] Absent 2 days and 6 hours without pay.

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Anual salary.	Period of service.		Amount received.	Residence when appointed.
			From—	To—		
	CLASS 1—Continued.					
83	Marcia Richardson, Miss[1]	$1,200	Dec. 1, 1890	Nov. 30, 1891	$1,097.95	Michigan.
84	Susan M. Landon[2]	1,200	July 1, 1891	....do	498.90	Vermont.
85	George H. Hammond[2]	1,200	....do	....do	498.90	Minnesota.
86	Oscar V. Mitchell[3]	1,200	Dec. 1, 1890	Nov. 30, 1891	1,030.91	Louisiana.
87	Louis Galeski[4]	1,200	....do	Aug. 11, 1891	838.07	New York.
88	E. D. Stone, Mrs[5]	1,200	....do	June 30, 1891	601.10	Massachusetts.
	CLASS E.					
89	M. H. Fillebrown, Mrs	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Dist. of Columbia
90	Eliza Wilkes, Miss[6]	1,000	....do	....do	918.44	Do.
91	E. S. Crawford, Miss	1,000	....do	....do	1,000.00	Virginia.
92	Jane P. Montgomery, Mrs.	1,000	....do	....do	1,000.00	Ohio.
93	Harriet Cnur, Mrs	1,000	....do	....do	1,000.00	Pennsylvania.
94	Joanna W. Turner, Mrs.	1,000	....do	....do	1,000.00	Wisconsin.
95	William Z. Ball	1,000	....do	....do	1,000.00	Michigan.
96	Smith C. Pedigo	1,000	....do	....do	1,000.00	Texas.
97	William D. Mackenzie	1,000	....do	....do	1,000.00	Illinois.
98	Benjamin F. Clayton[7]	1,000	Oct. 6, 1891	Nov. 30, 1891	152.25	New Jersey.
	Skilled Typewriters.					
99	Jennie B. Jones, Miss	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Dist. of Columbia.
100	Annie Harding, Mrs	1,000	....do	....do	1,000.00	Do.
101	Jennie Lawson, Miss	1,000	....do	....do	1,000.00	Massachusetts.
102	Katharine R. Hill, Mrs	1,000	....do	....do	1,000.00	Dist. of Columbia.
103	Annie E. Loomis, Mrs	1,000	....do	....do	1,000.00	Virginia.
104	Thomas Curran[8]	1,000	July 7, 1891	....do	399.53	Rhode Island.
	CLASS C.					
105	Henry Payne	840	Dec. 1, 1890	Nov. 30, 1891	840.00	Dist. of Columbia.
106	Patrick Wall	840	....do	....do	840.00	Do.
107	Charles Wilton	840	....do	....do	840.00	Do.
108	Henry Suydam[9]	840	....do	....do	837.80	Pennsylvania.
	CLASS B.					
109	George Phelps	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Dist. of Columbia.
110	Charles McDonough	720	....do	....do	720.00	Do.
111	George W. White	720	....do	....do	720.00	Ohio.
112	Jacob H. Frank	720	....do	....do	720.00	Maryland.
113	Christopher Shaw	720	....do	....do	720.00	Missouri.
114	John Whelan	720	....do	....do	720.00	Dist. of Columbia.
115	Charles E. Beller	720	....do	....do	720.00	West Virginia.
116	William Quinn	720	....do	....do	720.00	Dist. of Columbia.
117	Dennis Horrigan[10]	720	....do	....do	684.07	Do.
118	William H. Lewis[11]	720	....do	July 6, 1891	432.34	Do.
	CLASS A.					
119	Wallace Grant	660	Dec. 1, 1890	Nov. 30, 1891	660.00	Dist. of Columbia
120	Thomas Jones[12]	660	July 7, 1891	....do	261.85	Do.
121	Mary McGaw, Mrs	480	Dec. 1, 1890	....do	480.00	Do.
	Mechanic and builder.					
122	Clinton Smith[13]	2,500	July 2, 1891	Nov. 30, 1891	1,032.60	Vermont.
	Draftsmen.					
123	Irvin S. Hubbard[14]	1,800	Nov. 16, 1891	Nov. 30, 1891	73.37	Ohio.
124	Thomas P. Chiffelle[15]	1,800	Dec. 1, 1890	Apr. 27, 1891	735.12	West Virginia.
	Assistant Draftsmen.					
125	Gustav Friebus[16]	1,600	Dec. 1, 1890	June 30, 1891	934.80	Dist. of Columbia.
126	Millard F. Lynch	1,400	....do	Nov. 30, 1891	1,400.00	Virginia.

[1] Promoted from Class E, June 4, 1891.
[2] Transferred from Record and Pension Division, War Department, July 1, 1891.
[3] Promoted from Class E, Oct. 5, 1891.
[4] Died August 11, 1891.
[5] Transferred to Record and Pension Division, War Department.
[6] Absent 30 days without pay.
[7] Appointed October 5, 1891.
[8] Appointed July 7, 1891.
[9] Absent one day without pay.
[10] Promoted from laborer July 7, 1891.
[11] Died July 6, 1891.
[12] Transferred from depot quartermaster's office July 7, 1891.
[13] Appointed July 2, 1891.
[14] Appointed November 16, 1891.
[15] Died April 27, 1891.
[16] Position omitted in legislative, executive, and judicial appropriation bill for fiscal year ending June 30, 1891.

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continue

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS A—Continued.					
	Asst. Draftsmen—Cont'd.					
127	Arthur W. Hodgkins[1]	$1,200	Aug. 18, 1891	Nov. 30, 1891	$342.35	Dist. of Columb
128	Edgar M. Lazarus[2]	1,200	Dec. 1, 1890	Apr. 30 1891	500.00	Maryland.
	Civil engineer.					
129	Paul Bausch	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	New York.
	Assistant civil engineer.					
130	Theodore Friebus, jr	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Dist. of Columb

[1] Appointed August 18, 1891. [2] Resigned April 30, 1891.

Statement showing the names, compensation, etc., of clerks, messengers, and labore employed in the Office of the Commissary-General of Subsistence, from Decembe 1890, to November 30, 1891.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence wh appointed.
	CLASS B.					
1	William A. De Caindry	$2,000	Dec. 1, 1890	Nov. 30, 1891	$2,000.00	Maryland.
	CLASS 4.					
2	William H. Wetzel	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	Pennsylvania.
	CLASS 3.					
3	John Penn Jones	1,600	Dec. 1, 1890	Nov. 30, 1891	1,600.00	Pennsylvania.
4	Chas. T. Eldridge	1,600	....do	....do	1,600.00	Maine.
5	William H. Partridge	1,600	....do	....do	1,600.00	New York.
	CLASS 2.					
6	William Nourse	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	Maryland.
7	G. J. L. Foxwell	1,400	....do	....do	1,400.00	Army.
8	Charles N. Moore	1,400	....do	....do	1,400.00	Ohio.
9	Joseph S. Vansant[1]	1,400	....do	....do	1,398.67	Iowa.
	CLASS 1.					
10	R. S. Kearney	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Dist. of Columbi
11	William F. Johnson	1,200	....do	....do	1,200.00	Pennsylvania.
12	John Barr	1,200	....do	....do	1,200.00	Delaware.
13	Thomas M. Moran	1,200	....do	....do	1,200.00	Dist. of Columbi
14	Charles W. Pairo	1,200	....do	....do	1,200.00	Do.
15	S. Willard Knevals[2]	1,200	....do	Jan. 31, 1891	148.95	New York.
16	James B. K. Elliott	1,200	....do	Nov. 30, 1891	1,200.00	Do.
17	David W. Houghton	1,200	....do	....do	1,200.00	Ohio.
18	Jos. Blackwood	1,200	....do	....do	1,200.00	Pennsylvania.
19	Peter Meagher	1,200	....do	....do	1,200.00	Wisconsin.
20	Daniel Stewart	1,200	....do	....do	1,200.00	Missouri.
21	William Giusta	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Dist. of Columbi
22	Benjamin F. Smith	1,200	....do	....do	1,200.00	Do.
23	Walter F. Daly	1,200	....do	....do	1,200.00	Ohio.
24	Allen T. Lewis[3]	1,000	....do	Jan. 31, 1891	170.30	New Jersey.
		1,200	Feb. 1, 1891	Nov. 30, 1891	995.60	
					1,165.90	
	CLASS C.					
25	Alpheus W. Clear	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Pennsylvania.
26	A. J. Sanderson	1,000	....do	....do	1,000.00	Do.
27	Hermann H. Voss[4]	1,000	....do	Feb. 7, 1891	189.74	Dist. of Columb
28	Casper C. Weber[5]	1,000	....do	Feb. 15, 1891	211.97	Michigan.
29	Orville J. Mason	1,000	....do	Nov. 30, 1891	1,000.00	New York.

[1] Absent 2½ hours without pay.
[2] Absent 17 days without pay. Resigned January 31, 1891.
[3] Promoted February 1, 1891.
[4] Died February 7, 1891.
[5] Resigned February 15, 1891.

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS C—Continued.					
30	Henry A. Wallace	$1,000	Dec. 1, 1890	Nov. 30, 1891	$1,000.00	Indiana.
31	Alphonso Rogers	1,000	....do	....do	1,000.00	Missouri.
32	James E. Nelson	1,000	....do	....do	1,000.00	Michigan.
33	Howard S. Gott[1]	1,000	Mar. 16, 1891	....do	710.24	Ohio.
34	William F. Campfield[2]	1,000	Apr. 1, 1891	....do	665.80	Texas.
35	Ernest E. Russell[3]	1,000	June 1, 1891	....do	498.20	Nebraska.
	Assistant messengers.					
36	George Lackey	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Massachusetts.
37	Daniel Donovan	720	....do	....do	720.00	Do.
	Laborers.					
38	William Pinion	660	Dec. 1, 1890	Nov. 30, 1891	660.00	Louisiana.
39	James Hannan	660	....do	....do	660.00	Dist. of Columbia.

[1] Appointed March 16, 1891. [2] Appointed April 1, 1891. [3] Appointed June 1, 1891.

Statement showing the names, compensation, etc., of clerks, assistant messengers, watchmen, etc., employed in the office of the Surgeon-General of the Army, from December 1, 1890, to November 30, 1891.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS B.					
	Chief Clerk.					
1	John J. Beardsley[1]	$2,000	Dec. 1, 1890	Nov. 30, 1891	$2,000.00	New York.
	CLASS 4.					
2	Alonzo M. Buck	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	Wisconsin.
3	Cornelius P. Clark	1,800	....do	....do	1,800.00	Army.
4	David G. Dixon	1,800	....do	....do	1,800.00	Pennsylvania.
5	Harry O. Hall	1,800	....do	....do	1,800.00	Iowa.
6	Thomas G. Haviland	1,800	....do	....do	1,800.00	New York.
7	George A. Jones	1,800	....do	....do	1,800.00	Do.
8	Clement J. Myers	1,800	....do	....do	1,800.00	Do.
9	William Pittis	1,800	....do	....do	1,800.00	Army.
10	Samuel Ramsey[2]	1,800	....do	....do	1,800.00	Virginia.
11	Rudolph Ravenburg	1,800	....do	....do	1,800.00	Army.
12	Charles Roller	1,800	....do	....do	1,800.00	Maryland.
13	Edward Shaw	1,800	....do	....do	1,800.00	Massachusetts.
14	Reuben L. Shimer	1,800	....do	....do	1,800.00	New Jersey.
15	Frederick R. Sparks	1,800	....do	....do	1,800.00	New York.
16	Frederick W. Stone	1,800	....do	....do	1,800.00	Army.
17	Benjamin F. Williams	1,800	....do	....do	1,800.00	New York.
18	Edward K. Winship	1,800	....do	....do	1,800.00	Connecticut.
	CLASS 3.					
19	Frederick L. Apel	1,600	Dec. 1, 1890	Nov. 30, 1891	1,600.00	Pennsylvania.
20	Robert L. Clear	1,600	....do	....do	1,600.00	Dist. of Columbia.
21	John B. Davidson	1,600	....do	....do	1,600.00	Do.
22	William H. Degges	1,600	....do	....do	1,600.00	Texas.
23	Edward J. Jennings	1,600	....do	....do	1,600.00	New York.
24	Samuel Johnston	1,600	....do	....do	1,600.00	Washington
25	Joseph F. Loughran	1,600	....do	....do	1,600.00	New York.
26	James C. McConnell	1,600	....do	....do	1,600.00	Ohio.
27	Peter Preuss[1]	1,400 1,600	....do Mar. 11, 1891	Mar. 10, 1891 Nov. 30, 1891	386.19 1,158.53 1,544.72	New York.
28	Joseph R. Rose	1,600	Dec. 1, 1890	....do	1,600.00	Army.
29	William Schwennecker	1,600	....do	....do	1,600.00	Do.
30	William H. Stuard[3]	1,600	....do	Feb 25, 1891	383.71	Pennsylvania.
31	Frederick W. Storch	1,600	....do	Nov. 30, 1891	1,600.00	Dist. of Columbia.
32	Matthew H. Teulon	1,600	....do	....do	1,600.00	Massachusetts.

[1] Promoted. [2] Reduced. [3] Died.

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Conti

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence appoint
	CLASS 3—Continued.					
33	Bertis B. Thompson[1]	$1,400	Dec. 1, 1890	Mar. 5, 1891	$366.74	
		1,600	Mar. 6, 1891	Nov. 30, 1891	1,180.76	Indiana.
					1,547.50	
34	Bogislav Zglinitzki	1,600	Dec. 1, 1890	do	1,600.00	Dist. of Co
	CLASS 2.					
35	Major W. Bayliss	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	Rhode Isla
36	James H. Bessling	1,400	do	do	1,400.00	New York
37	Raymond F. Cardella	1,400	do	do	1,400.00	Missouri.
38	William E. Childs[2]	1,400	do	Feb. 15, 1891	296.83	Ohio.
39	John N. Ehle	1,400	do	Nov. 30, 1891	1,400.00	Wisconsin
40	Neilson Falls	1,400	do	do	1,400.00	North Car
41	David Flynn	1,400	do	do	1,400.00	Army.
42	Adam Gelb	1,400	do	do	1,400.00	New York
43	Ira Gordon	1,400	do	do	1,400.00	Ohio.
44	William Guilford, jr	1,400	do	do	1,400.00	Maryland.
45	Robert W. Hardy	1,400	do	do	1,400.00	Iowa.
46	John A. Hasson[1]	1,200	do	Mar. 5, 1891	314.47	
		1,400	Mar. 6, 1891	Nov. 30, 1891	1,033.01	Delaware.
					1,347.48	
47	James D. Hendley	1,400	Dec. 1, 1890	do	1,400.00	Dist. of Co
48	J. Melvin Lamb[1]	1,200	do	Mar. 10, 1891	331.13	
		1,400	Mar. 11, 1891	Nov. 30 1891	1,013.77	Pennsylva
					1,344.90	
49	Daniel E. Lattimore	1,400	Dec. 1, 1890	do	1,400.00	Indiana.
50	James S. McFarland	1,400	do	do	1,400.00	Pennsylva
51	Stephen C. Miller[3]	1,400	do	do	1,384.82	Minnesota
52	Jacob G. Moore	1,400	do	do	1,400.00	Dist. of Co
53	Wilhelm T. W. Moritz	1,400	do	do	1,400.00	Alabama.
54	William H. Neill	1,400	do	do	1,400.00	Massachus
55	Joshua Nicholls[1 4]	1,200	do	Feb. 28, 1891	197.83	
		1,400	Mar. 1, 1891	Nov. 30, 1891	1,052.70	Georgia.
					1,250.53	
56	Edward M'C. Noel	1,400	Dec. 1, 1890	do	1,400.00	Missouri.
57	Isaac P. Noyes	1,400	do	do	1,400.00	Rhode Isla
58	Thomas O'Beirne	1,400	do	do	1,400.00	Army.
59	Charles H. Pennington	1,400	do	do	1,400.00	Texas.
60	Lewis H. Rose	1,400	do	do	1,400.00	New York.
61	Joshua T. Smith	1,400	do	do	1,400.00	Do.
62	John W. Sowden	1,400	do	do	1,400.00	Michigan.
63	James W. St. Clair	1,400	do	do	1,400.00	Dist. of Co
64	Pierre C. Stevens	1,400	do	do	1,400.00	Pennsylva
65	Alexander C. Varela	1,400	do	do	1,400.00	California.
66	Charles Watson	1,400	do	do	1,400.00	Massachus
	CLASS 1.					
67	Charles Abert	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Maryland.
68	Lorenz Auber	1,200	do	do	1,200.00	Army.
69	Anton Becker	1,200	do	do	1,200.00	Do.
70	Silas Berryman	1,200	do	do	1,200.00	Maryland.
71	Cassius F. Blacklidge	1,200	do	do	1,200.00	Colorado.
72	Archibald Brown[1]	1,000	do	Mar. 5, 1891	261.99	
		1,200	Mar. 6, 1891	Nov. 30, 1891	885.57	New Jerse
					1,147.56	
73	Mathew Bryan	1,200	Dec. 1, 1890	do	1,200.00	Army.
74	Frank Coburn	1,200	do	do	1,200.00	Ohio.
75	Raleigh E. Colston	1,200	do	do	1,200.00	Virginia.
76	William H. Conley	1,200	do	do	1,200.00	North Car
77	Frederick A. Cooley	1,200	do	do	1,200.00	Georgia.
78	Charles C. Coombs	1,200	do	do	1,200.00	Missouri.
79	John C. Cox	1,200	do	do	1,200.00	Ohio.
80	Albert G. Drane	1,200	do	do	1,200.00	Georgia.
81	William E. Etka	1,200	do	do	1,200.00	Pennsylva
82	Alfred H. Gawler	1,200	do	do	1,200.00	Dist. of Co

[1] Promoted.
[2] Died.
[3] Absent 4 days without pay.
[4] Absent 30 days without pay.

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received	Residence when appointed.
	CLASS 1—Continued.					
83	Homer Guerry[1]	$1,000	Dec. 1, 1890	Feb. 28, 1891	$248.10	Georgia.
		1,200	Mar. 1, 1891	Nov. 30, 1891	902.20	
					1,150.30	
84	William D. Henry	1,200	Dec. 1, 1890	do	1,200.00	Virginia.
85	Philip Jaisohn[1]	1,000	do	Feb. 28, 1891	248.10	Pennsylvania.
		1,200	Mar. 1, 1891	Nov. 30, 1891	902.20	
					1,150.30	
86	Walter S. Kaye	1,200	Dec. 1, 1890	do	1,200.00	Missouri.
87	Patrick M. Kelly	1,200	do	do	1,200.00	West Virginia.
88	William S. McPherson	1,200	do	do	1,200.00	Dist. of Columbia.
89	Frank Martin	1,200	do	do	1,200.00	South Carolina.
90	Noble Moore	1,200	do	do	1,200.00	Tennessee.
91	William C. Myers[2]	1,600	do	Mar. 10, 1891	441.44	Pennsylvania.
		1,200	Mar. 11, 1891	Nov. 30, 1891	868.90	
					1,310.34	
92	William Palmer	1,200	Dec. 1, 1890	do	1,200.00	Army.
93	W. Stanley Pitts	1,200	do	do	1,200.00	Iowa.
94	John F. Reardon	1,200	do	do	1,200.00	Ohio.
95	Matthew Ryan	1,200	do	do	1,200.00	New York.
96	George C. Samson	1,200	do	do	1,200.00	Dist. of Columbia.
97	Edward G. Seibert	1,200	do	do	1,200.00	Pennsylvania.
98	Lincoln B. Smith[3]	1,200	May 21, 1891	do	624.06	Wisconsin.
99	Mayrie E. Stout	1,200	Dec. 1, 1890	do	1,200.00	Illinois.
100	Milo C. Summers	1,200	do	do	1,200.00	Do.
101	Maria Thomas	1,200	do	do	1,200.00	Dist. of Columbia.
102	Parter Tracy[4]	1,200	do	Feb. 25, 1891	287.73	Massachusetts.
103	Fred Van Dyne[4]	1,200	do	Apr. 30, 1891	500.00	New York.
104	Nelson P. Webster[3]	1,200	Dec. 2, 1890	Nov. 30, 1891	1,196.73	Do.
105	George W. Weed	1,200	Dec. 1, 1890	do	1,200.00	Ohio.
106	John M. R. Welsh	1,200	do	do	1,200.00	Dist. of Columbia.
	CLASS C.					
	Clerks, Class $1,000.					
107	Arthur L. Bemis[3 4]	1,000	Dec. 13, 1890	Mar. 14, 1891	254.42	Michigan.
108	Sherman B. Fowler	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Virginia.
109	George A. Fuchs[4]	1,000	do	Oct. 31, 1891	918.40	Pennsylvania.
110	Fielding H. Garrison[3]	1,000	Mar. 4, 1891	Nov. 30, 1891	743.58	Virginia.
111	August V. Gisiger	1,000	Dec. 1, 1890	do	1,000.00	Illinois.
112	Baruch Israeli	1,000	do	do	1,000.00	Connecticut.
113	Eliza C. Lancaster[3]	1,000	do	do	997.20	Dist. of Columbia.
114	J. Julius Lund[3]	1,000	Nov. 1, 1891	do	81.60	Illinois.
115	Marvin H. Nye[3]	1,000	Apr. 9, 1891	do	643.84	Michigan.
116	William F. Osborne[3]	1,000	Apr. 20, 1891	do	613.62	Arkansas.
117	Crosby E. Stoddard	1,000	Dec. 1, 1890	do	1,000.00	Michigan.
118	Pere G. Wallmo[3]	1,000	Apr. 15, 1891	do	627.36	Connecticut.
119	William Whitehill	1,000	Dec. 1, 1890	do	1,000.00	Virginia.
	CLASS B.					
	Anatomist.					
120	Edwin R. Hodge	1,600	Dec. 1, 1890	Nov. 30, 1891	1,600.00	Maryland.
	Engineer.					
121	William B. Kimball	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	Connecticut.
	CLASS C.					
	Skilled Mechanic.					
122	John F. Wild	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Dist. of Columbia.
	Assistant Engineer.					
123	George W. Johnson	900	Dec. 1, 1890	Nov. 30, 1891	900.00	Dist. of Columbia.

[1] Promoted.
[2] Reduced.
[3] Appointed.
[4] Resigned.
[5] Absent 1 day without pay.
[6] Transferred from substitute Adjutant-General's Office.

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continu

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence wh appointed.
	CLASS C—Continued.					
	Assistant Messengers.					
124	James O. Bampfield	$720	Dec. 1, 1890	Nov. 30, 1891	$720.00	South Carolin
125	Samuel Bryant	720	do	do	720.00	Dist. of Colun
126	John F. Cody	720	do	do	720.00	Pennsylvania
127	John Fogarty	720	do	do	720.00	Army.
128	Martin Gannon	720	do	do	720.00	Do.
129	James Greenfield	720	do	do	720.00	Dist. of Colun
130	John J. Hanlon	720	do	do	720.00	New York.
131	James R. Harris	720	do	do	720.00	Mississippi.
132	Eli Jackson	720	do	do	720.00	Dist. of Colun
133	William Myers	720	do	do	720.00	Do.
134	Richard Osborne	720	do	do	720.00	Virginia.
135	Jesse W. Sisson	720	do	do	720.00	Rhode Island.
	Watchmen.					
136	John G. Burkhardt	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Dist. of Colun
137	William McCoy	720	do	do	720.00	Pennsylvania.
138	Frederick Neujahr	720	do	do	720.00	Missouri.
	Firemen.					
139	James W. Allison	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Maryland.
140	Philip Moloney[1]	720	do	July 15, 1891	449.95	New York.
141	Charles A. Wissing[2]	720	Sept. 5, 1891	Nov. 30, 1891	170.27	Dist. of Colum
	Laborers.					
142	Morris Downs	660	Dec. 1, 1890	Nov. 30, 1891	660.00	New York.
143	John Gilroy	660	do	do	660.00	Dist. of Colum
144	James A. Miller	660	do	do	660.00	Do.
145	Cornelius Morgan[3]	660	do	June 15, 1891	358.40	Virginia.
146	Charles A. Payton[4]	660	Sept. 4, 1891	Nov. 30, 1891	157.82	Do.
147	Christopher P. Phillips	660	Dec. 1, 1890	do	660.00	Dist. of Colum
148	Thomas D. Rankin[1 5]	660	June 16, 1891	June 30, 1891	27.20	Tennessee.
	Superintendent of Building.					
149	Alfred H. Gawler	250	Dec. 1, 1890	Nov. 30, 1891	250.00	Dist. of Colum

[1] Resigned.
[2] Appointed.
[3] Transferred to Record and Pension Division June 16, 1891.
[4] Transferred from office of Secretary of W
[5] Transferred from Record and Pension D sion.

Statement showing the names, compensation, etc., of clerks, messengers, and labor employed in the office of the Paymaster General from December, 1, 1890, to Novem 30, 1891.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence whe appointed.
	CLASS B.					
	Chief Clerk.					
1	G. D. Hanson	$2,000	Dec. 1, 1890	Nov. 30, 1891	$2,000	Dist. of Columb
	CLASS 4.					
2	W. G. Newton	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800	Ohio.
3	T. M. Exley	1,800	do	do	1,800	Massachusetts.
4	M. M. Bartlett	1,800	do	do	1,800	New Hampshir
5	B. P. Murray	1,800	do	do	1,800	New York.
6	A. P. Eastman	1,800	do	do	1,800	Massachusetts.
7	J. P. Pearson	1,800	do	do	1,800	New Hampshir
	CLASS 3.					
8	J. A. Sterling	1,600	Dec. 1, 1890	Nov. 30, 1891	1,600	Ohio.
9	W. H. Harrison	1,600	do	do	1,600	Maryland.
10	A. M. Salmon	1,600	do	do	1,600	New Jersey.
11	C. F. Cobb	1,600	do	do	1,600	Maryland.
12	F. I. Willis	1,600	do	do	1,600	New York.

nt showing names, compensation, etc., of clerks, messengers, etc.—Continued.

Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
CLASS 2.					
. Hickenlooper	$1,400	Dec. 1, 1890	Nov. 30, 1891	$1,400	Iowa.
B. Royce	1,400	....do	....do	1,400	Vermont.
. H. Winfield	1,400	....do	....do	1,400	New York.
. Diver	1,400	....do	....do	1,400	Do.
. Thomason	1,400	....do	....do	1,400	Do.
. MacNamee	1,400	....do	....do	1,400	Massachusetts.
n Wright	1,400	....do	....do	1,400	Vermont.
d. Thomson	1,400	....do	....do	1,400	Army.
rin Frey	1,400	....do	....do	1,400	West Virginia.
CLASS 1.					
iel Shannon	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200	Army.
. Lester	1,200	....do	....do	1,200	Illinois.
ssistant Messenger.					
. Leighter	720	Dec. 1, 1890	Nov. 30, 1891	720	Dist. of Columbia.
Laborers.					
s. Brannan	660	Dec. 1, 1890	Nov. 30, 1891	660	Dist. of Columbia.
. Lane	660	....do	....do	660	Do.
es Loveless	660	....do	....do	660	Do.
F. Kellogg	660	....do	....do	660	Vermont.

nt showing names, compensation, etc., of clerks, messengers, and laborers, yed in the office of the Chief of Engineers, U. S. Army, from December 1, 1890, vember 30, 1891.

Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
CLASS B.					
Chief Clerk.					
liam J. Warren	$2,000	Dec. 1, 1890	Nov. 30, 1891	$2,000.00	New York.
CLASS 4.					
rge T. Woodward	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	Dist. of Columbia.
neas J. Dempsey	1,800	....do	....do	1,800.00	Virginia.
derick J. Willoughby	1,800	....do	....do	1,800.00	New Hampshire.
verley D. Drinkard	1,800	....do	....do	1,800.00	Dist. of Columbia.
CLASS 3.					
es Eveleth[1]	1,600	Dec. 1, 1890	Apr. 16, 1891	605.13	Virginia.
idemar Jansen	1,600	....do	Nov. 30, 1891	1,600.00	New York.
sfield A. McCarthy	1,600	May 5, 1891	....do	915.78	Dist. of Columbia.
CLASS 2.					
ert Grimes	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	Dist. of Columbia.
ian Garner	1,400	....do	....do	1,400.00	Do.
nk D. Fletcher	1,400	....do	....do	1,400.00	New York.
CLASS 1.					
man J. Glover	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Iowa.
n F. Kelly	1,200	....do	....do	1,200.00	New York.
ddeus S. Clark	1,200	....do	....do	1,200.00	Dist. of Columbia.
CLASS C.					
n H. McElroy	1,000	Dec. 1, 1890	July 23, 1891	646.70	Illinois.
bert L. Davis	1,000	July 24, 1891	Nov. 30, 1891	353.34	Dist. of Columbia.
CLASS D.					
ssistant Messenger.					
ry M. Dixon	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Mississippi.
Laborers.					
liam H. Piper	660	Dec. 1, 1890	Nov. 30, 1891	660.00	Massachusetts.
ry Player	660	Dec. 15, 1890	....do	634.89	Iowa.

[1] Died April 16, 1891.

List of persons employed in the office of the Chief of Engineers, showing the amount pa to each from December 1, 1890, to November 30, 1891, inclusive, to carry into eff the various appropriations for rivers and harbors, fortifications, and surveys f military defenses.

No.	Names.	Annual salary.	Period of service.		Amount received.	Residence whe appointed.
			From—	To—		
	CLASS A.					
	Draftsman.					
1	William W. Winship	$2,100	Dec. 1, 1890	Nov. 30, 1891	$2,100.00	Dist of Columbi
	CLASS 4.					
	Draftsmen.					
2	Denis Callahan	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	Maryland.
3	John S. Winship	1,800	....do	....do	1,800.00	Dist. of Columbi
	Clerks.					
4	Sacket Duryee	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	Virginia.
5	George W. Koonce	1,800	....do	....do	1,800.00	South Carolina.
	CLASS 3.					
6	James A. Edgar	1,600	Dec. 1, 1890	Nov. 30, 1891	1,600.00	Pennsylvania.
7	Mirand W. Saxton	1,600	....do	....do	1,600.00	Massachusetts.
8	George C. Thomas	1,600	....do	....do	1,600.00	Dist. of Columbi
9	Richard W. Burgess	1,600	....do	....do	1,600.00	Do.
10	Henry A. Curtis	1,600	....do	....do	1,600.00	Vermont.
11	Sarsfield A. McCarthy	1,600	....do	May 4, 1891	684.45	Dist. of Columbi
12	John B. Nichols	1,600	....do	Nov. 30, 1891	1,600.00	New York.
13	Herbert L. Buell	1,600	....do	....do	1,600.00	Do.
14	Charles Gulentz	1,400	....do	July 31, 1891	933.34	Pennsylvania.
		1,600	Aug. 1, 1891	Nov. 30, 1891	533.33	
					1,466.67	
	CLASS 2.					
	Draftsman.					
15	Martin Altschuh	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	Pennsylvania.
	Clerks.					
16	Samuel M. Marsh[1]	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	Pennsylvania.
17	William B. Johns	1,400	....do	....do	1,400.00	Dist. of Columbi
18	Henry B. King	1,400	....do	....do	1,400.00	Missouri.
19	J. Hanson Price	1,400	....do	....do	1,400.00	Virginia.
20	John C. S. Burger[2]	1,400	....do	....do	1,400.00	Dist. of Columbi
21	August Schausten	1,400	....do	....do	1,400.00	Indiana.
22	Eugene J. Williams	1,400	....do	....do	1,400.00	New York.
23	Court F. Wood[3]	1,400	....do	....do	1,398.07	Michigan.
24	John T. Elker	1,200	....do	Jan. 4, 1891	113.33	Pennsylvania.
		1,400	Jan. 5, 1891	Nov. 30, 1891	1,267.76	
					1,381.09	
25	Joseph E. Leaming	1,200	May 1, 1891	Sept. 22, 1891	473.33	New Jersey.
		1,400	Sept. 23, 1891	Nov. 30, 1891	264.43	
					737.76	
	CLASS 1.					
	Draftsmen.					
26	Joel R. P. Mechlin	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Dist. of Columbi
27	Albert N. Ober	1,200	....do	....do	1,200.00	Do.
28	Joseph von Glümer	1,200	....do	....do	1,200.00	New York.
	Clerks.					
29	William H. Watson	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Maryland.
30	William M. Davis	1,200	....do	....do	1,200.00	Dist. of Columbi

[1] On duty in Office of Secretary of War from August 12, 1891.
[2] On duty in Office of Secretary of War.
[3] Absent one-half day in excess of thirty days in 1890.

nt showing names, compensation, etc., of clerks, messengers, etc.—Continued.

Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed
LASS 1—Continued.					
Clerks—Continued.					
ıry C. Sayles	$1,200	Dec. 1, 1890	Nov. 30, 1890	$1,200.00	Rhode Island.
hur L. Hodgkins[1]	1,200	....do	Feb. 24, 1891	238.34	Dist. of Columbia.
ıtave Bender[2]	1,000	....do	July 31, 1891	666.67	Texas.
	1,200	Aug. 1, 1891	Nov. 30, 1891	329.29	
CLASS D.				995.96	
ert Sillers	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Dist. of Columbia.
y E. Anderson	1,000	....do	....do	1,000.00	Indiana.
n T. Woods	1,000	....do	Feb. 23, 1891	230.55	Do.
bert L. Davis	1,000	....do	July 23, 1891	647.23	Dist. of Columbia.
lip H. Mattingly	1,000	Mar. 1, 1891	Nov. 30, 1891	749.99	Do.
ert U. Crosby	1,000	Mar. 18, 1891	Oct. 22, 1891	597.22	Iowa.
n F. Riley	1,000	Aug. 24, 1891	Nov. 30, 1891	269.44	California.
l S. Orleman	1,000	Nov. 11, 1891	....do	55.55	Florida.
Mechanic.					
liam H. Deckman	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Dist. of Columbia.
Copyist.					
ıes F. Fealy[3]	900	Dec. 1, 1890	Apr. 28, 1891	368.75	Ohio.
Messengers.					
liam J. Lee	840	Dec. 1, 1890	Nov. 30, 1891	840.00	Virginia.
rles Haerle	840	....do	....do	840.00	Dist. of Columbia.
n C. Williamson	840	....do	....do	840.00	New Jersey.
derick C. Hartmann	840	....do	....do	840.00	Dist. of Columbia.
son J. Booker	840	....do	....do	840.00	Massachusetts.
ssistant messenger.					
ıry Tudy	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Dist. of Columbia.
Skilled laborer.					
ıd S. L. Johnson	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Dist. of Columbia.

[1] Absent 12½ days in excess of 30 days in 1890.
[2] Absent 21 days 1 hour 30 minutes in excess of 30 days in 1891.
[3] Absent ½ day in excess of 30 days in 1890. Died, April 28, 1891.

nt showing the names, compensation, etc., of clerks, messengers, etc., employed office of the Chief of Ordnance from December 1, 1890, to November 30, 1891.

Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
Chief Clerk.					
n J. Cook	$2,000	Dec. 1, 1890	Nov. 30, 1891	$2,000.00	Dist. of Columbia.
CLASS 4.					
n Moran	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	Army.
. Skillman	1,800	....do	....do	1,800.00	New Jersey.
W. Pentland	1,800	....do	....do	1,800.00	Pennsylvania.
CLASS 3.					
. Bryant	1,600	Dec. 1, 1890	Nov. 30, 1891	1,600.00	Wisconsin.
. Sutton	1,600	....do	....do	1,600.00	Pennsylvania.
CLASS 2.					
. Hull	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	Illinois.
rles S. Keller	1,400	....do	....do	1,400.00	Dist. of Columbia.

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	CLASS 1.					
9	Charles E. Bailey	$1,200	Dec. 1, 1890	Nov. 30, 1891	$1,200.00	Dist. of Columbia.
10	Austin Edgerly	1,200	....do	....do	1,200.00	Maine.
11	R. A. Foster	1,200	....do	....do	1,200.00	Dist. of Columbia.
12	Seth L. Clark	1,200	....do	....do	1,200.00	Vermont.
13	S. E. Culverwell	1,200	....do	....do	1,200.00	Maryland.
14	James S. Pierce	1,200	....do	....do	1,200.00	Pennsylvania.
15	Nathan Hazen	1,200	....do	....do	1,200.00	Do.
16	John L. Wilkins	1,200	....do	....do	1,200.00	Dist. of Columbia.
17	George H. Ingraham	1,200	....do	....do	1,200.00	South Carolina.
18	W. A. Morsell	1,200	....do	....do	1,200.00	Dist. of Columbia.
19	John A. Madigan	1,200	....do	....do	1,200.00	Do.
20	James M. Wimmer	1,200	....do	July 3, 1891	710.88	Indiana.
21	James A. Wagner	1,200	....do	Nov. 30, 1891	1,200.00	Illinois.
22	Charles J. Hopkins	1,200	....do	....do	1,200.00	Dist. of Columbia.
23	Julia M. Edie	1,200	....do	....do	1,200.00	Do.
24	Mary H. Eastman	1,200	....do	....do	1,200.00	New York.
25	Sophie I. Mahon	1,200	....do	....do	1,200.00	Pennsylvania.
26	Harry C. Surguy	1,200	....do	Jan. 19, 1891	164.43	Ohio.
27	Walter A. Bule	1,200	....do	Nov. 30, 1891	1,200.00	Massachusetts.
28	Hugh M. Purcell	1,200	....do	....do	1,200.00	Ohio.
29	Frank L. Stevens	1,200	....do	July 31, 1891	802.20	Missouri.
30	Robert E. Woods	1,200	....do	Nov. 30, 1891	1,200.00	Kentucky.
31	William A. Miller	1,000	....do	Jan. 19, 1891	136.98	Kansas.
		1,200	Jan. 20, 1891	Nov. 30, 1891	1,035.60	
					1,172.58	
32	Frank A. Roderick	1,000	Jan. 26, 1891	July 3, 1891	438.72	West Virginia.
		1,200	July 4, 1891	Nov. 30, 1891	489.10	
					927.82	
33	Winfield S. Clarke	1,000	July 15, 1891	Aug. 2, 1891	51.63	Dist. of Columbia.
		1,200	Aug. 3, 1891	Nov. 30, 1891	391.27	
					442.90	
	CLASS C.					
34	John M. Smith	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Army.
35	Edward K. De Puy	1,000	Aug. 25, 1891	....do	1,000.00	South Dakota.
	Messengers.					
36	Stephen Ganz	840	Dec. 1, 1890	Nov. 30, 1891	840.00	Pennsylvania.
37	John A. Simms	840	....do	....do	840.00	Maryland.
	Assistant messenger.					
38	William D. Buckley	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Dist. of Columbia.
	Laborer.					
39	A. A. Hunnicutt	660	Dec. 1, 1890	Nov. 30, 1891	660.00	Virginia.

Names of clerks, messengers, and laborers employed in the Signal Office, War Department, from July 1, 1891 (date of reorganization under the provisions of act of Congress, approved October 1, 1890) to November 30, 1891, with their grades, annual compensation, amounts paid, etc., in accordance with the requirements of section 194 of the Revised Statutes.

No.	Names.	Annual salary.	Period of srvice. From—	Period of srvice. To—	Amount received.	Residence when appointed.
	Clerks.					
1	Otto A. Nesmith	$1,800	July 1, 1891	Nov. 30, 1891	$748.40	California.
2	George A. Warren	1,200	....do	....do	498.90	New York.
3	Daniel J. Carr	1,200	....do	....do	498.90	Connecticut.
	Messenger.					
4	Thomas Callahan	840	July 1, 1891	Nov. 30, 1891	349.20	Massachusetts.
	Laborer.					
5	John Turley	660	July 1, 1891	Nov. 30, 1891	274.40	Dist. of Columbia.

Statement showing the names, compensation, etc., of experts, clerks, copyists, copyholders, messengers, laborers, etc., employed in the office of the publication of the Official Records of the Rebellion, from December 1, 1890, to November 30, 1891:

No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	Civilian Experts.					
1	Leslie J. Perry*	$3,500	Dec. 1, 1890	Nov. 30, 1891	$3,500.00	Michigan.
2	Joseph W. Kirkley*	3,500	....do	....do	3,500.00	Maryland.
	Agent.					
3	Marcus J. Wright	2,000	Dec. 1, 1890	Nov. 30, 1891	2,000.00	Tennessee.
	Assistant Compiler.					
4	Cadmus M. Wilcox*[1]	1,800	Dec. 1, 1890	Dec. 2, 1890	9.78	Tennessee.
	Indexer.					
5	John S. Moodey*	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	Ohio.
	Compiler.					
6	Charles W. Field*[2]	1,800	Jan. 9, 1891	Nov. 30, 1891	1,463.43	Dist. of Columbia.
	CLASS 4.					
7	E. J. Harvie	1,800	Dec. 1, 1890	Nov. 30, 1891	1,800.00	Virginia.
8	F. Collins Smith	1,800	....do	....do	1,800.00	Maryland.
9	Francis U. Stitt	1,800	....do	....do	1,800.00	Dist. of Columbia.
10	Joseph Darr	1,800	....do	....do	1,800.00	Ohio.
	CLASS 3.					
11	John N. Bovee	1,600	Dec. 1, 1890	Nov. 30, 1891	1,600.00	Pennsylvania.
12	Virginia E. Dade	1,600	....do	....do	1,600.00	Kentucky.
13	Ida R. Morris	1,600	....do	....do	1,600.00	Texas.
	Assistant Compiler.					
14	Thomas C. Bourne*[3]	1,600	Dec. 1, 1890	Nov. 30, 1891	1,482.00	New York.
	Chief Proof-Reader.					
15	Justin A. Runyan*[4]	1,600	Dec. 1, 1890	Nov. 30, 1891	1,466.20	Missouri.
	Assistant Compiler.					
16	Dabney H. Maury*[5]	1,500	Aug. 3, 1891	Oct. 31, 1891	366.81	Virginia.
	CLASS 2.					
17	Sarah H. Purcell	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	New York.
18	R. W. Kerr	1,400	....do	....do	1,400.00	Ohio.
	Proof-Readers.					
19	John J. Heron*	1,400	Dec. 1, 1890	Nov. 30, 1891	1,400.00	New Jersey.
20	Charles W. Kirkley*	1,400	....do	....do	1,400.00	Maryland.
21	Frank E. Chapin*	1,400	....do	....do	1,400.00	Illinois.
22	William Henry*	1,400	....do	....do	1,400.00	Dist. of Columbia
23	Geo. W. Hinman*	1,400	....do	....do	1,400.00	New York.
24	George W. Cox*[6]	1,400	....do	....do	1,266.30	Maryland.
25	Robert W. Kerr, jr.*[6]	1,400	....do	....do	1,266.30	Do.
26	Charles M. Robinson*[7]	1,400	....do	Mar. 31, 1891	467.90	Indiana.
27	Robert A. Brock*[8]	1,400	....do	Feb. 15, 1891	296.83	Virginia.
28	Sidney H. Kent*[9]	1,400	....do	Nov. 30, 1891	1,164.16	Maryland.
	CLASS 1.					
29	Annie E. Byus	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Maryland.
30	Mary F. Guss	1,200	....do	....do	1,200.00	Pennsylvania.
31	Edward David	1,200	....do	....do	1,200.00	Ohio.

* Paid out of appropriation for "publication of the Official Records of the Rebellion."
[1] Died Dec. 2, 1890.
[2] Appointed indexer, $1,500, Jan. 9, 1891; promoted to compiler, $1,800, July 2, 1891.
[3] Promoted from proof-reader, at $1,400, July 2, 1891.
[4] Promoted from proof-reader, at $1,400, Aug. 1, 1891.
[5] Appointed Aug. 3, 1891; appointment expired Oct. 31, 1891.
[6] Promoted from copyholder, $1,000, Apr. 1, 1891.
[7] Resigned Mar. 31, 1891.
[8] Appointed Dec. 1, 1890; resigned Feb. 15, 1891.
[9] Promoted from copyholder, $1,000, July 2, 1891.

Statement showing the names, compensation, etc., of clerks, messengers, etc.—Continued.

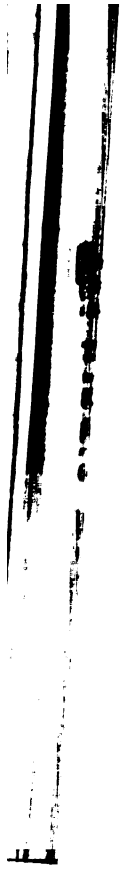
No.	Names.	Annual salary.	Period of service. From—	Period of service. To—	Amount received.	Residence when appointed.
	Pressmen and compositors.					
32	A. C. Shaw	$1,200	Dec. 1, 1890	Nov. 30, 1891	$1,200.00	Dist. of Columbia
33	Herbert L. Childs	1,200	....do	....do	1,200.00	Massachusetts.
	Indexer.					
34	Charles Rastaetter*	1,200	Dec. 1, 1890	Nov. 30, 1891	1,200.00	Wyoming.
	Assistant compiler.					
35	T. Walter Mattingly*[1]	1,200	Dec. 1, 1890	Nov. 30, 1891	999.40	Illinois.
	Compositor.					
36	Harry Mills	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Virginia.
	Copyholder.					
37	Robert F. Sillers*	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Dist. of Columbi
	Label Printer.					
38	Thomas Sheridan*	1,000	Dec. 1, 1890	Nov. 30, 1891	1,000.00	Dist. of Columbi
	Forwarders.					
39	George Le Cointe*[2]	1,000	Dec. 1, 1890	June 5, 1891	501.80	New York.
40	Charles T. M. Cutcheon*	1,000	July 1, 1891	Nov. 30, 1891	415.80	Michigan.
	Assistant Compiler.					
41	Lucy G. Crane*[3]	1,000	Dec. 1, 1890	Nov. 30, 1891	941.09	New York.
	Copyists.					
42	James A. Edwards	900	Dec. 1, 1890	Nov. 30, 1891	900.00	New York.
43	Wells F. Andrews	900	....do	....do	900.00	Michigan.
44	James W. Byler[4]	900	May 15, 1891	....do	490.43	Missouri.
	Copyholders.					
45	Walter C. Byrne	900	Dec. 1, 1890	Nov. 30, 1891	900.00	New York.
46	Frederick L. Cox[5]	900	May 1, 1891	....do	525.00	Virginia.
	Expert Copyists.					
47	Presley C. Hunt*	900	Dec. 1, 1890	Nov. 30, 1891	900.00	Dist. of Columbia
48	Grace C. Keefer*	900	....do	....do	900.00	Pennsylvania.
49	Helen M. Chamberlin*	900	....do	....do	900.00	Dist. of Columbia.
50	Alice C. Hill*	900	....do	....do	900.00	Kansas.
51	Ralph D. Childs*	900	....do	....do	900.00	Massachusetts.
52	Maria Mills*	900	....do	....do	900.00	Dist. of Columbia.
53	Julia Wheeler*	900	....do	....do	900.00	North Carolina.
54	Elizabeth H. Lyons*[6]	900	....do	Jan. 1, 1891	75.80	Virginia.
	Assistant Compilers.					
55	George Thompson*	900	Dec. 1, 1890	Nov. 30, 1891	900.00	Dist. of Columbia.
56	Charles F. Parsons*[7]	900	Jan. 9, 1891	July 22, 1891	483.80	Minnesota.
	Assistant Indexers.					
57	Catherine G. Powers*	900	Dec. 1, 1890	Nov. 30, 1891	900.00	Vermont.
58	Mary Reimensnyder*	900	....do	....do	900.00	Pennsylvania.
59	Ellen W. Keen*	900	....do	....do	900.00	Dist. of Columbia.
60	Katharine Lackland*	900	....do	....do	900.00	Oregon.
61	Kath. H. W. Stull*	900	....do	....do	900.00	Dist. of Columbia.
62	Alice T. Anderson*	900	....do	....do	900.00	Maryland.
	Expert Typewriter.					
63	Ida M. Winn*[8]	900	Dec. 1, 1890	Feb. 28, 1891	223.30	Michigan.

*Paid out of appropriation for "publication of the Official Records of the Rebellion."
[1] Promoted from expert copyist, $900, Aug. 1, 1891.
[2] Discharged June 5, 1891.
[3] Promoted from expert copyist, $900, July 2, 1891.
[4] Appointed May 15, 1891.
[5] Appointed May 1, 1891.
[6] Resigned Jan. 1, 1891.
[7] Appointed Jan. 9, 1891; resigned July 22, 1891.
[8] Discharged Feb. 28, 1891.

Statement showing names, compensation, etc., of clerks, messengers, etc.—Continued.

No.	Names.	Annual salary.	Period of service.		Amount received.	Residence when appointed.
			From—	To—		
	Assistant Forwarder.					
64	Patrick Carroll*	$900	Dec. 1, 1890	Nov. 30, 1891	$900.00	Dist. of Columbia.
	Assistant Messengers.					
65	Charles Keegin	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Dist. of Columbia.
66	Harrison Terrell	720	....do	....do	720.00	Do.
	Watchmen.					
67	Samuel S. Noland	720	Dec. 1, 1890	Nov. 30, 1891	720.00	Dist. of Columbia.
68	S. H. Lomax	720	....do	....do	720.00	Virginia.
	Examiners of Archives.[1]					
69	Eva J. Lawton*[2]	720	Sept. 7, 1891	Sept. 30, 1891	46.96	Dist. of Columbia.
70	Lydia M. Powers*	720	....do	Nov. 30, 1891	166.36	Vermont.
71	Estelle B. Viall*	720	....do	....do	166.36	New York.
72	Kate B. Cook*	720	Sept. 16, 1891	....do	148.75	Do.
73	Fanny J. King*	720	Sept. 23, 1891	....do	135.05	Vermont.
74	Emma D. Ayer*	720	Sept. 24, 1891	....do	133.10	Do.
75	Josephine B. Placide*	720	....do	....do	133.10	Pennsylvania.
76	Ella P. Karcher*	720	Oct. 6, 1891	....do	108.67	Dist. of Columbia.
	Laborer.					
77	Ernest Beechner	600	Dec. 1, 1890	Nov. 30, 1891	600.00	Dist. of Columbia.
	Packers.					
78	Fred D. Henry*	600	Dec. 1, 1890	Nov. 30, 1891	600.00	Virginia.
79	Edward S. O'Connor*	600	....do	....do	600.00	Dist. of Columbia.
80	John L. Carroll*[3]	600	{Apr. 7, 1891 {Oct. 22, 1891	{May 9, 1891 {Nov. 30, 1891	131.10	Do.

* Paid out of appropriation for "publication of the Official Records of the Rebellion."
[1] Appointed on dates indicated under "period of service."
[2] Resigned Sept. 30, 1891.
[3] Appointed Apr 7, 1891; discharged May 9, 1891. Reappointed Oct. 22, 1891; appointment expired Nov. 30, 1891.



52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { EX. DOC. No. 18.

COMMERCE PASSING ST. MARYS FALLS CANAL.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING,

With a letter from the Chief of Engineers, a report of the commerce passing St. Marys Falls Canal.

JANUARY 5, 1892.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 21, 1891.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, dated the 18th instant, submitting a report dated the 16th instant from Col. O. M. Poe, Corps of Engineers, in reference to the commerce passing St. Marys Falls Canal, Michigan, during the season of 1891, and to concur in the recommendation of the Chief of Engineers that, in view of the magnitude and importance of the interests involved, the report be printed.

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 18, 1891.

SIR: I have the honor to submit the accompanying report, dated December 16, 1891, by Col. O. M. Poe, Corps of Engineers, in reference to the commerce passing St. Marys Falls Canal, Michigan, during the season of 1891, just closed, and in view of the magnitude and importance of the interests involved, to recommend that it be transmitted to Congress with request that it be printed.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brigadier-General, Chief of Engineers.

Hon. L. A. GRANT,
Acting Secretary of War.

COMMERCE PASSING ST. MARYS FALLS CANAL, MICHIGAN, DURING THE SEASON OF 1891.

UNITED STATES ENGINEER OFFICE,
Detroit, Mich., December 16, 1891.

GENERAL: I have the honor to submit the following report upon the commerce passing St. Marys Falls Canal during the season of 1891, just closed. At this work statistics for the season are necessarily those of the calendar year.

The canal opened for navigation April 27, 1891, and closed December 7. The season was therefore 225 days long, or 3 days shorter than in 1890.

The average number of vessels passing per day for the whole season was 45.3, and for the months of June, July, August, and September the average was 54.6.

The size of the vessels continues to increase, as is shown in the following statistics:

The average registered tonnage per vessel was—	Tons.
In 1887	626.3
In 1888	701.5
In 1889	790.5
In 1890	833.8
In 1891	862.1

The total registered tonnage for the season falls 53,750 tons short of that for 1890, and the freight tonnage was 152,454 tons less. The following discussion of the appended statistics may not be inappropriate:

For the whole period since 1881 the iron ore carried through the canal has been 47 per cent of the total freight, and in 1889 and 1890 it was more than 50 per cent; therefore the freight may be divided into two nearly equal parts, one of which was the iron ore, the remainder being the aggregate of all other freights. The percentage of increase since 1881 falls between 12 and 39 each year, the average being 22. During 1890 the freight other than iron ore amounted to 4,266,445 tons, and for 1891 to 5,328,548 tons. This shows an increase of 25 per cent in the freight of 1891, other than iron ore, over 1890, or a little more than the average increase for the preceding ten years. Hence the decrease in iron-ore freight alone is sufficient to explain why the business of 1891 did not show the usual increase. There were other causes, however, which materially affected the volume of the season's business, and they will be referred to later.

The falling off in iron-ore freight was predicted with certainty a year ago. It was due to causes so widespread and long continued that a discussion here could hardly be made complete and satisfactory.

The freight of wheat and wheat products was abnormally large. Excluding iron ore and wheat in 1890 the remaining tonnage was 3,725,866 tons. The corresponding freight for 1891 was 4,340,660 tons. Hence the increase in freight, exclusive of iron ore, was 8 per cent, which indicates quite a falling off from the average rate of 22 per cent for the last ten years, and shows that if the wheat crop of the northwest had not been unusually good this season there would have been a slight decrease in the volume of freight other than iron ore.

The foregoing relates solely to tonnage. If we consider the value of the season's freight we find a very large increase over any other.

The average yearly increase in the value of the freight transported since 1881 was about 15 per cent, but for the season of 1891 it was about 25 per cent. The cause of this great increase in valuation is plainly

due to the very large wheat crop. Since we are not likely to be immediately favored with another such crop, a decrease in valuation may be reasonably predicted for next year.

But the failure to maintain the record of annual increase in freight tonnage is due, in a great degree, to three causes other than the decrease in iron-ore tonnage.

The first of these is the fact that the stage of water in the lakes, and consequently the depth available at the canal, was the lowest of which we have any record. In 1889 the average available depth was 15.14 feet, in 1890 it was 15.06 feet, and in 1891 it was 14.42 feet. The average for 1891 was, therefore, 0.64 feet, or 7.6 inches lower than in 1890, which, at a reasonable estimate of 20 tons to an inch of draft, corresponds to an average of, say, 150 tons for each registered vessel; that is, if the available depth of water in the canal during 1891 had been equal to that of 1890 (the next lowest recorded), the same 9,744 vessels which carried 8,888,759 tons in 1891, would have carried 1,461,359 tons more than they did, or an aggregate of 10,350,359 tons, or, say, 10,000,000. This is no violent estimate, but is, I think, quite within the truth.

The next cause was the intentional delay of the vessel men in putting their vessels in commission in the spring. This amounted to quite two weeks in the case of many of the largest carriers. No attempt is made to estimate the effect of the delay, but it must have been considerable.

The third cause was due to the sinking of the steamer *Susan E. Peck*, at "The Elbow," in St. Marys River, by which navigation was totally suspended from 1:10 p. m., October 11, to 3 p. m., October 15, a period of full five days. Two hundred and seventy-five vessels were delayed an aggregate of eight hundred and twenty-seven days five hours, or an average of about three days each, during which time they would have carried through the canal about 150,000 tons of freight if they had been free to move. This fairly offsets the delay during the preceding season due to the broken emptying valve.

In view of the foregoing, it would be a conservative estimate to say that but for the conditions stated the freight through the canal would have amounted to 10,500,000 tons during the season of 1891.

In estimating the value of the commerce passing through the canal it is deemed advisable to adhere to the same prices per unit first adopted in 1885. It is believed that these constitute a fair average and afford a better basis for comparing the business from year to year than if they were amended to conform to the prices actually prevailing.

Very respectfully, your obedient servant,

O. M. POE,
Colonel, Corps of Engineers, etc.,
Brevet Brigadier-General, U. S. A.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

Comparative statement of the amount and value of commerce through St. Marys Falls Canal, Michigan, for the calendar years 1890 and 1891.

Items.	Quantity.		Increase.		Decrease.	
	1890.	1891.	Amount.	Per cent.	Amount.	Per cent.
Vessels*.....number..	10,557	10,191			366	3
Lockages.....do....	4,970	4,981	11	0		
Tonnage, registered.....net tons..	8,454,435	8,400,685			53,750	1
Tonnage, freight.....do....	9,041,213	8,888,759			152,454	2
Passengers.....number..	24,856	26,190	1,334	5		
Coal (hard and soft).....net tons..	2,176,925	2,507,532	330,607	18		
Flour.....barrels..	3,239,104	3,780,143	541,039	17		
Wheat.....bushels..	16,217,370	38,816,570	22,599,200	139		
Grain (other than wheat).....do....	2,044,384	1,032,104			1,012,280	50
Manufactured iron.....net tons..	93,615	42,560			51,055	55
Pig iron.....do....	22,712	27,181	4,469	19		
Salt.....barrels..	179,431	234,528	55,097	31		
Copper.....net tons..	43,729	69,190	25,461	58		
Iron ore.....do....	4,774,768	3,560,213			1,214,555	25
Lumber.....M ft.B. M..	361,929	366,305	4,376	1		
Silver ore and bullion.....net tons..	3,432	1,731			1,701	50
Building stone.....do....	47,973	44,080			3,893	8
Unclassified freight†.....do....	371,294	417,093	45,799	12		

Items.		Total valuation.		
		Price per unit.	1890.	1891.
Vessels*.....number..				
Lockages.....do....				
Tonnage, registered.....net tons..				
Tonnage, freight.....do....				
Passengers.....number..				
Coal (hard and soft).....net tons..		$3.50	$7,619,237.50	$8,776,362.00
Flour.....barrels..		5.00	16,195,520.00	18,900,715.00
Wheat.....bushels..		.98	15,893,022.60	38,040,238.60
Grain (other than wheat).....do....		.98	2,003,496.32	1,011,461.92
Manufactured iron.....net tons..		50.00	4,680,750.00	2,128,000.00
Pig iron.....do....		17.00	386,104.00	462,077.00
Salt.....barrels..		1.00	179,431.00	234,528.00
Copper.....net tons..		200.00	8,745,800.00	13,838,000.00
Iron ore.....do....		3.50	16,711,688.00	12,460,745.50
Lumber.....M ft. B. M..		18.00	6,514,722.00	6,593,490.00
Silver ore and bullion.....net tons..		153.79	527,807.28	266,210.49
Building stone.....do....		10.00	479,730.00	440,800.00
Unclassified freight†.....do....		60.00	22,277,640.00	25,025,580.00
Totals.....			102,214,948.70	128,178,208.51

Steamers*.....	7,339
Sails.....	2,405
Unregistered crafts.....	447
Total.....	10,191

†Included in unclassified freight for 1891—

Wool.....tons..	2,602
Hides.....number..	480

Valuation based on estimates of 1885.

Valuation for—	
1885.....	$53,413,472.13
1886.....	69,080,071.95
1887.....	79,031,757.78
1888.....	82,156,019.97
1889.....	83,732,527.15
1890.....	102,214,948.70
1891.....	128,178,208.51

Canal was open to navigation during season of 1890, 228 days; 1891, 225 days.

52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc. No. 19.

CIVILIAN EMPLOYÉS OF THE ARMY.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING

A list of all civilian employés of the Army, with the amount paid to each from the appropriation for the support of the Army.

JANUARY 5, 1892.—Referred to the Committee on Expenditures in the War Department and ordered to be printed.

WAR DEPARTMENT,
Washington, December 21, 1891.

SIR: I have the honor to transmit herewith, in compliance with the act making appropriations for the support of the Army for the fiscal year ending June 30, 1892, and for other purposes, approved February 24, 1891, lists of all civilian employés, with the amounts paid to each from the appropriations for the Subsistence, Quartermaster's, Medical, and Ordnance Departments of the Army during the fiscal year 1891.

The Chief of Engineers reports that no part of the appropriations made under this act for the Engineer Department has been used for the payment of civilian employés.

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

List of names of all civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department.

[Furnished in accordance with act of Congress approved February 24, 1891 (Army bill).]

Names.	Amounts.	Names.	Amounts.
Jacob Amann	$480.00	C. Aristele	$60.00
J. A. Alcorn	900.00	Henry Avery	7.35
R. H. Adams	624.00	Aston	4.00
John Andrews	500.00	H. A. Anderson	2.50
Henry Arfman	68.35	Chas. Anderson	16.35
Richard Albrecht	300.00	John Anderson	13.62
Thomas Ahearn	3.00	John Ahufeldt	9.63
James Archer	150.00	Mic. Adams	114.00
Anthony A. Abbott	360.00	J. T. Archibald	48.00
Charles Allen	269.00	Thos. Adams	42.00
Frank Alford	243.00	Adolph Allard	29.25
W. C. Averill	1,800.00	Hans Aspaas	14.00
E. P. S. Andrews	270.00	Samuel Abrahamson	71.25
C. W. Aldridge	15.50	F. L. Austin	160.00
Al. A. Alton	192.00	D. Ahern	15.75
J. B. Arnold	1.25	Chas. Anderson	64.00
Miguel Artegan	8.33	Tony Augustin	121.00
Thomas Adams	62.00	H. Avery	18.00
John Asmus	589.00	J. E. Armour	3.00
J. M. Allen	1,800.00	T. Addison	8.65
David Aiken	1,200.00	W. H. Blake	242.33
W. C. Atwell	14.75	Richard Bond	720.00
M. T. Alford	1,400.00	Patrick Boyhan	720.00
J. W. Anderson	900.00	W. J. Bodill	1,200.00
Wm. Armbruster	23.75	Joseph Boyhan	75.00
Chas. M. Augur	1,600.00	M. Broutman	474.00
James Arnold	360.00	Jacob Brenen	474.00
John Anderson	480.00	A. Bennett	60.00
M. G. Ashbrook	554.66	Samuel Bruce	420.00
Jens Anderson	480.00	John Black	562.50
Geo. R. Armstrong	1,200.00	Theo. Billings	480.00
Swan Anderson	540.00	W. Burkett	295.00
H. N. Anderson	131.83	A. Beversdorff	864.00
W. H. Acker	95.00	Green Banks	12.50
Thos. Atkins	720.00	Peter Bausher	360.00
Kenneth Allen	600.00	Amil Behrens	1,350.00
E. S. Abernathy	48.00	B. Buchanan	140.00
King Arthur Athold	11.20	F. M. Bingham	1,445.53
Amanda	10.85	J. G. Blake	100.00
Attis	53.55	Charles Baker	264.00
O. Atkins	2.70	Dorsey Brown	360.00
A. Arnold	72.10	George Baker	420.00
T. Arnold	21.50	Martin Bentley	120.00
W. M. Arnold	39.20	Anseline Brouillet	212.00
Latham Anderson and assistants	2,580.00	G. W. Bush	720.00
C. W. Aldridge	68.75	A. Bengston	18.00
Thos. Anderson	78.32	Arthur Bussey	960.00
Gust Anderson	51.27	Frederic W. Baker	1,000.00
Peter Anderson	30.36	John Burke	355.00
James Allison	11.23	Richard Barron	49.00
Fred. Anderson	4.20	James Bright	720.00
Emil Adguist	4.20	G. Becker	720.00
Wm. Adams	.26	G. Bentley	420.00
John Ayers	732.68	Conrad Bollinger	1,800.00
Otto Arnold	600.00	G. F. Blackford	1,000.00
C. H. Austin	278.33	J. T. Brown	720.00
M. Aniso	12.00	Joseph Beris	470.83
J. Allala	3.00	E. E. Brown	31.34
H. L. Allis	1,400.00	C. A. Brown	900.00
G. Ashbaugh	188.50	B. Buchanan	280.00
Jeremiah Allen	151.00	George R. Baker	306.67
James Ahearn	1,020.00	M. R. Brock	1,600.00
Enoch Ayers	529.00	R. B. Barnes	10.00
Geo. W. Albright	1,800.00	Charles Belnap	10.00
Geo. W. Abbott	1,000.00	A. E. Bourne	420.00
Henry Alden	12.00	P. J. Burke	300.00
Francis Albertson	648.00	Marsellino Burke	154.00
Wm. Albertson	648.00	Robert Benjamin	720.00
F. J. Albright	1,600.00	Joseph Baudel	800.00
John Akin	486.00	A. Bennett	52.52
John G. Allison	648.00	J. C. Bramwell	1,400.00
Charles Abbott	500.00	Charles Brown	165.07
Ass-to-yey	45.85	Arthur J. Broadwater	1,000.00
Sixto A. Arizola	74.00	John Brown	720.00
U. S. Allison	10.00	C. M. Brooks	720.00
Isaac A. Allison	15.00	Geo. C. Booth	720.00
Peter Angus	4.37	Albert Brown	420.00
W. Allen	4.00	Richard Barron	4.00
G. Arnold	9.95	Orrin H. Bulkley	8.25

employés and the amounts paid to each during the fiscal year 1891 who are aid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
. Bogie	$51.00	John Burke	$486.00
Bates	234.00	Geo. C. Bonner	1,600 00
hm	540.00	J. B. Bristoe	6.00
noist	496.00	H. B. Beer	3.00
ebee	15.00	R. B. Beer	3.00
nard	42.00	Will Browne	1,600.00
ennett	1,400.00	Fred Brandes	840.00
Bulk	300.00	A. J. Bentgston	420.00
Benison	487.33	O. Barnett	93.33
ll	177.33	Frank Bels	77.45
ckey	87.90	August Breckman	35.00
britton	3.75	J. F. Bruel	250.00
mel	609.34	Broken Rope Sam'l	32.50
ain	320.00	Bad Wound	19.50
lehrend	30.00	Sam'l Bird	5.63
rker	16.50	Broken Lea	5.63
h	150.00	Blue Heart	5.63
Bell	100.00	J. R. Beatty	5.00
Brown	14.00	W. H. Birdsall	40.00
rugen	300.00	H. W. Bailey	16.00
tis	6.00	B. M. Brown	105.75
Brown	401.50	Walter Butler	360.00
Byrnes	960.00	A. J. Butts	360.00
W. Baker	21.00	E. D. Beck	360.00
Brennan	3.50	W. B. Bechtel	49.00
Brett	720.00	W. F. Bennett	300.00
urke	360.00	Wm. Berry	60.00
lawer	14.67	James W. Bobo	270.00
own	28.00	J. W. Bull	720.00
Brown	360.00	W. R. Barrett	870.66
urkman	17.50	J. Burkman	278.00
gen	191.00	J. Burdick	383.00
	3.00	Martin Burns	540.00
Barnes	1,080.00	Roy A. Baxter	480.00
Bremer	650.00	M. Baxter	900.00
J. Bliss	1,800.00	F. E. Benham	720.00
orge Bliss	1,400.00	Wm. E. Buckman	1,200.00
rnard	300.00	M. E. Brown	4.00
Brockman	172.50	Richard Botfield	360.00
urkley	10.00	Felix Burgess	720.00
Benjamin	51.00	Frank Best	67.25
Brugier	92.00	Frederick Bickford	150.00
an Brown	575.00	A. Black	5.00
Brown	420.00	G. E. Brandon	98.00
hen	1,200.00	John Barber	310.00
key	180.00	John Booth	109.67
lley	720.00	Chas. Benham	85.17
ttler	16.87	Bin-day	98.10
ker	30.00	Bill	59.55
ain	6.00	Be-he-do	28.75
Brown	900.00	Bah-ga-do	38.30
. Brown	177.33	Burbotte-tlo-nah	11.90
Brooks	413.33	Jacob Bainbridge	320.00
iger	15.00	G. T. Bidell	616.50
ot	6.00	D. Brooks	10.83
ker	11.25	J. Beavers	3.90
Bomersen	140.00	A. Bowen	22.70
wen	50.00	W. Barge	4.00
ugge	1,600.00	D. O. Barge	8.90
mfield	1,400.00	M. Brown	9.90
ird	24.00	A. Bell	118.40
nson	7.50	W. Boings	23.34
Burke	7.50	H. Barge	6.67
veridge	810.65	A. Boings	156 01
Berthold	400.00	D. Beavers	182 76
ennett	900.00	H. Brown	165 55
aman	600.00	B. Bullock	7 00
Boese	420.00	J. H. Bailey	51.60
ayer	812.00	E. Bell	88.63
lley	549.86	F. Burdett	2.60
Baner	238.33	J. Blackman	8.10
B. Bridge	75.00	L. F. Burdett	6.00
n Bamper	49.00	W. Barkley	2.00
udel	1,200.00	S. Barnes	2.90
yer	720.00	Fred Busch	23.70
Buck	120.00	Fred Brackmyer	7.00
ock	96.90	Henry Berrycomb	13.00
irton	72.00	Frank M. Button	1,558.33
er	40.00	Fred Boynton	480.00
Barrett	540.00	Philip J. Barry	4.80
aker	19.83	J. R. W. Berg	144 30

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
Edward Biggins	$299.38	Geo. H. Beers	[illegible]
John Benson	8.30	W. H. Brown	[illegible]
Francis Bonner	2.40	N. P. Batchelder	[illegible]
Christ Baner	74.38	Norris Bradeen	[illegible]
Barnet Barley	5.60	Henry M. Black	[illegible]
Thos. O. Brien	1.75	Joseph Berry	[illegible]
Richard Burke	98.99	Frank Berry	[illegible]
John Bergguist	3.75	Henry G. Blair	[illegible]
John Bowers	90.00	F. B. Bond	[illegible]
Wm. Bolander	38.85	Chas. M. Bywater	[illegible]
George Bremer	100.00	Nathaniel Barr	[illegible]
J. H. Biggar	1,800.00	John Bryson	[illegible]
T. B. Baker	1,400.00	R. P. Barr	[illegible]
Joseph Bohnen	296.83	H. C. Barton	[illegible]
John P. Bohnen	624.00	Joseph W. Buck	[illegible]
Peter Blasius	284.00	Charles Borbor	[illegible]
Norris Beaddeen	50.00	M. J. Bigley	[illegible]
Abram Brokaw	545.00	A. Butler	[illegible]
John H. Brown	1,200.00	Louis J. Berry	[illegible]
R. W. Bishop	480.00	Frank J. Brady	[illegible]
W. Barker	388.50	L. J. Blumenthal	[illegible]
W. J. Buehler	88.00	Edward Barry	[illegible]
O. W. Barnett	210.83	John Bruguier	[illegible]
John Butler	50.16	Peter Babb	[illegible]
William Banks	52.67	Stephen B. Burke	[illegible]
Paul Brady	95.00	Charles Bierer	[illegible]
Harvey Brandige	18.67	Frank Brozille	[illegible]
William Berry	90.00	John B. Benton	[illegible]
J. J. Burdick	90.00	Alex. Butts	[illegible]
John L. Burns	795.00	Geo. W. Blood	[illegible]
J. H. Beddow	480.00	James Baxter	[illegible]
J. E. Brady	206.67	S. M. Bloom	[illegible]
August Bloome	360.00	D. Bumsen	[illegible]
Wm. Beddow	360.00	Black Horse	[illegible]
J. L. Boyer	9.00	Black Heart	[illegible]
P. Butler	90.00	Charley Burns	[illegible]
James J. Bragan	368.00	Saml. Brown	[illegible]
Dan'l E. Barrett	166.50	Joseph Brown	[illegible]
John Bright	346.66	Saml. W. Bird	[illegible]
John Burgess	92.50	Paul Brady	[illegible]
James Ball	27.49	Henry Brundige	[illegible]
John Burke	8.12	Broken Time	[illegible]
John Burrell	35.62	Henry Behuke	[illegible]
Ed. Ball	36.75	Perry S. Bartley	[illegible]
Chas. S. Beach	16.25	Thomas Broadwater	[illegible]
J. B. Burless	28.12	John Bloomquist	[illegible]
J. A. Ball	73.50	Allen Black	[illegible]
Frank Beach	41.87	Elisha Blackwell	[illegible]
Levi Boykin	51.24	Thos. J. Blake	[illegible]
Isaac Brockenberry	21.25	Burdette	[illegible]
W. H. Butler, sr	69.06	Marcellus Burke	[illegible]
Frank Baker	8.12	Manuel Benal	[illegible]
L. Boykin	10.00	E. K. Berkey	[illegible]
Thomas Bell	33.96	M. P. Brown	[illegible]
F. Beach	5.62	Geo. W. Barlow	[illegible]
W. Beach	83.37	H. Butterfield	[illegible]
Henson Burrows	23.43	William G. Barlow	[illegible]
John Bowers	33.75	O. Butterfield	[illegible]
William Bowers	34.37	S. M. Benson	[illegible]
Albert Brown	24.37	F. C. Brennan	[illegible]
H. Burton	13.12	J. H. Ballinger	[illegible]
T. S. Butcher	8.75	Jas. W. Bryan	[illegible]
Randall Bates	26.86	Jos. Bell	[illegible]
J. H. Batchelder	600.00	Wm. Brown	[illegible]
F. E. Barrean	720.00	J. B. Butterworth	[illegible]
John Bartley	780.00	H. L. Barker	[illegible]
John Barnard	780.00	Worden Beach	[illegible]
Annie Barrean	360.00	W. H. Butler, jr	[illegible]
Jos. H. Baxter	140.00	Ben. Buttler	[illegible]
Wm. Borchers	105.00	William Bauman	[illegible]
W. H. Bartholomew	1,200.00	Ed. Beach	[illegible]
Valentine Bressler	638.75	Albert Brooks	[illegible]
J. D. Brooking	609.00	John Brooks	[illegible]
Henry Buckrels	548.87	Thomas Brown	[illegible]
Albert Bobb	366.00	Mary A. Bolar	[illegible]
W. T. Berry	940.08	Albert Burnett	[illegible]
E. H. Baldwin	1,600.00	M. Burch	[illegible]
Isaac Brinkworth	600.00	B. Bennett	[illegible]
Charles Beesom	480.00	J. Brown	[illegible]
R. A. Bostis	1.50	G. T. Baker	[illegible]
David B. Beesom	4.12	L. R. Bell	[illegible]

employés and the amounts paid to each during the fiscal year 1891 who are id from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
:s	$42.55	Michael Cross	33.00
ywater	30.00	P. Coghlan	1.00
kman	64.00	John Callahan	46.00
)wn	21.25	W H. Campbell	1,800.00
. Boyd	5.00	W. H. Clearance	600.00
	17.85	D. A. Crutchfield	388.00
hlay	17.15	D. F. Crowley	720.00
)wn(eer	183.33	Pashal Carter	81.44
urke	11.37	Jerry Crutchfield	85.94
Burn	5.16	James Clagett	109.94
n	59.67	T. Coughlin	900.00
d	12.00	A. Coughlan	655.00
Burns	6.56	J. Carney	420.00
nson	40.25	M. Cain	414.17
Beske	17.67	Geo. A. Courtright	1,000.00
lake	17.67	Carl. Carlson	114.30
urkholder	15.05	Jens Christiansen	47.00
rke	8.75	O. A. Cavan	10.00
hue	22.75	Reuben Cash	125.00
nagan	26.07	James Candlish	4.50
Byrne	24.53	Joseph Carroll	20.00
Burke	8.23	James Conlon	360.00
nsore	17.32	Thomas Curtlett	236.00
Buckley	18.81	W. U. Casey	25.00
ck	2.62	Peter Cornelius	24.00
k	21.00	Charles Clark	1,059.98
urke	6.38	S. H. Church	300.00
iley	150.00	John Callahan	363.00
ack	20.00	C. C. Coulter	141.33
own	16.50	Thos. Crawford	14.00
enis	105.00	G. L. Cruickshank	900.00
rns	153.05	George Christie	7.00
rkman	56.00	James P. Canty	33.50
	35.00	James Cassidy	400.00
rrigan	75.00	James Coleman	360.00
Bevis	69.75	Charles Coleman	360.00
cker	32.00	William Coleman	360.00
uett	88.00	Robert Coleman	54.00
rnham	78.00	J. Clane	89.49
)wen	46.00	Luz Caballero	45.85
rtlett	2.50	Apolonio Caballero	14.85
ıkert	78.00	Emetriso Caballero	6.75
ergey, sr	93.00	W. L. Coakley	1,800.00
lergey, jr	123.00	H. A. Christenson	1,508.00
ckmiller	76.00	John Connor	520.00
)wdin	88.00	W. E. Coleman	1,800.00
mer	160.00	F. W. Cousins	1,400.00
rown	37.50	J. F. Chase	500.00
. Boyd	10.50	H. H. Clark	456.67
evius	5.00	Charles Coates	51.00
)wn	17.70	J. A. Campbell	1,600.00
e	11.10	Charles Cacely	720.00
it	7.00	Thomas Crawford	337.16
wan	4.35	John Connolly	480.00
Berry	26.10	N. Coffee	150.00
er	19.80	John Cleghorn	381.50
n Baline	80.00	T. H. Carroll	29.25
rooks	64.50	T. J. Church	70.00
	8.62	J. A. Carlson	10.00
ker	17.62	Charles Cassler	6.00
ein	15.00	Geo. H. Clarke	960.00
Becker	2.50	John Chandler	72.00
. Berry	150.00	G. M. Caldwell	150.00
Burke	57.39	J. K. Creighton	1,400.00
raun	11.47	Levi Clarke	800.00
rooks, jr	33.33	Stephen Conrad	600.00
Baldwin	18.45	W. F. Clarke	400.00
nningham	$900.00	R. S. Cox	435.00
ffin	720.00	Thos. S. Clark	664.75
rk	480.00	James C. Crain	440.00
nnell	71.75	E. G. Carson	1,400.00
eghorn	1,200.00	Howard Carpenter	276.69
ark	360.00	George M. Chase	300.00
Cleary	1,600.00	Andrew Callerhan	50.00
Campbell	157.50	George Carson	226.67
Crespo	195.00	Richard Childers	28.00
Centro	1,200.00	Jno. R. Cissna	480.00
Cunningham	600.00	A. J. Clapman	1,200.00
bble	31.00	L. C. Car	120.00
bbell	56.50	Daniel M. Clarkson, jr	20.00
ollins	360.00	H. B. Chase	15.00

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
Charles Crowley	$540.00	E. Carrigan	$122.50
L. S. Carr	35.00	W. O. Commins	67.33
James T. Cullerton	45.00	Michael Cribbens	93.34
Mary E. Carter	567.50	Peter Carroll	180.00
T. W. Cartleyon	7.75	Ed. A. Carroll	90.00
C. B. Counch	480.00	J. M. Collins	60.00
Hugh Carey	480.00	Dennis Crowley	300.00
T. F. Casey	87.50	John H. Clarke	250.00
Cunning White Deer	19.50	William Case	262.00
Yankton Casper	6.50	Michael Carney	300.00
Jefferson Chips	6.50	Geo. T. Curry	300.00
J. M. Carnahan	147.33	James Condon	83.00
Thomas Connors	70.00	William Carter	60.00
Richard Chambers	15.17	Robert Clark	60.00
John Caldwell	10.00	Larkin Coleman	300.00
Ben. Clark	1,200.00	John Connell	192.33
L. M. Cornwell	100.00	James Connell	480.00
J. Chambers	360.00	William Crompton	240.00
E. Carroll	60.00	Charles Cooksey	281.00
J. F. Crowley	900.00	C. D. Collins	333.34
Joseph Cahill	66.67	P. Carter	14.27
Geo. H. Cahoo	1,000.00	John Coleman	7.50
Thos. Clemons	30.00	J. Crutchfield	25.00
Prospire Cadieux	32.00	Joseph Curren	22.00
Frank Cox	106.00	Geo. W. Conway	13.12
R. R. Clarke	220.00	John Chase	14.00
John Corless	1,000.00	E. I. Clinkett	25.12
James Corless	720.00	J. T. Crenshaw	3.75
S. R. Cole	403.00	R. K. Chase	1,800.00
Amos Chapman	1,200.00	J. M. Corrigan	960.00
W. H. Carter	360.00	Edward Cassin	619.05
Pat'k Conway	306.00	Richard Carr	1.05
W. M. Curtis	900.00	Louis Carventes	1,000.00
Che-Chil	96.60	W. J. Croley	1,200.00
Chato	96.60	August Cook	3.50
Coonie	96.60	Robert Creighton	1,800.00
Cleuny	18.55	Jerome Circey	480.00
Fred. W. Cooke	1,800.00	Benton Carlin	480.00
Chas. H. Carter	1,200.00	W. A. Collins	17.25
W. Callier	86.67	W. W. Crooker	1,200.00
P. Connelly	136.26	E. W. Craig	200.00
A. Coles	108.33	Cyrus Cleaves	1,080.00
W. Coza	6.67	John Connor	140.00
G. W. Carson	234.17	Chas. W. Coffin	840.00
J. Coles	83.33	John Costello	720.00
J. Comb	9.80	Hugh Coyle	900.00
J. Cohen	7.50	Thomas Cosgrove	17.50
J. Camp	46.25	James Cosgrove	17.50
Het. Craddock	3.70	James Costello	10.50
H. D. Crane	300.00	Carrie D. Chase	946.62
Wm. H. Crook	736.00	J. Cunningham	1,400.00
Gust. Carlson, No. 1	169.65	W. H. Cochran	737.50
Gust. Carlson, No. 2	119.76	P. Considine	720.00
Charles E. Clifton	33.52	T. H. Cook	720.00
Oscar Carlson	53.55	B. F. Cox	648.00
Daniel Cuhmins	3.15	Joseph L. Cameron	648.00
Patrick Collins	30.63	John Carrigan	648.00
Michael Conley	3.33	John Cross	648.00
Daniel Collins	9.00	John E. Cochran	648.00
John Clark	11.20	P. J. Condon	60.00
William Connelly	1.75	Fred. D. Comerick	40.00
W. H. Clark	8.33	George W. Cone	25.00
J. Crimmins	3.75	George Cameron	15.00
A. Castro	12.00	G. H. Cook	41.08
S. Castro	12.00	J. W. Coleman	5.00
S. Charvis	12.00	E. T. Carr	25.00
Indian Charlie	12.00	Crow Eagle	45.00
C. Cheney	4.00	M. J. Canning	15.00
Edward Conley	255.00	Charge Eagle	10.40
G. H. Conradt	1,800.00	Coming First	8.23
A. N. Chamberlin	1,056.00	Richard Chambers	36.83
Michael Carrigan	720.00	H. G. Chandler	29.17
John Conell	360.00	Coming Amongst	13.00
M. Carmody	420.00	O. H. Clark	288.33
Wm. H. Cooke	1,600.00	Nathaniel Collins	256.67
H. E. Calahan	1,400.00	J. A. Cole	30.00
B. Converse	1,200.00	M. E. Cowles	22.00
Martin Churchill	720.00	John W. Clark	30.00
Michael Conlin	480.00	Louis Clark	2.33
H. E. Cutting	480.00	Richard Clayton	200.00
H. H. Clark	525.00	Pedro Carnigo	132.33

in employés and the amounts paid to each during the fiscal year 1891 who are aid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
d Cass	$74.00	P. H. Dolan	$720.00
› Caldwell	40.00	Chas. M. Doty	180.00
laven	66.00	Thos. D. Dinwoody	206.40
m Claven	6.00	Thomas Donlin	192.00
Campbell	24.00	Adelbert Dobson	1,200.00
Clements	162.50	W. H. Detrick	49.72
lements	42.50	Edward Donohue	180.00
W. Chapin	184.00	W. A. Dempsey	800.00
arlson	28.88	John Doran	175.00
Chandler	6.00	Wm. F. de Young	130.00
W. Clark	160.00	Henry Danks	900.00
ter	6.56	E. M. Dunham	66.25
k Cady	39.00	M. Donoghue	25.00
)per	5.62	H. Daniels	391.50
Campbell	4.37	Chas. A. Doyle	72.00
trell	23.35	Edward Donnelly	31.25
	16.45	John Dudley	18.75
lds	14.65	Charles Distler	600.00
hivers	1.00	Charles De Clair	160.00
leary	56.00	James B. Dix	240.00
rlton	25.63	Edward B. Davis	10.00
	2.80	C. Daly	150.00
	17.85	Chas. P. Daly	210.00
Collins	24.10	Earnest Dietrick	5.00
nors	8.66	Irwin H. Dwelley	1,000.00
Connor	8.05	H. Daily	54.83
Cornell	47.28	William Doyle	599.40
Cunningham	16.00	William Duclin	600.00
Connor	15.75	John Donnell	454.17
Chambers	13.32	William Derwitt	1,200.00
ıere	15.65	J. S. Dougherty	22.22
Collins	3.00	L. J. Dutton	39.00
norton	15.75	Luke Dumphy	402.00
ny Coughlin	29.17	Henry Daniels	159.00
Christianson	94.50	Edward Diamond	261.00
Close	20.00	Geo. W. Dougherty	32.00
m Cole	4.00	Saml. Donaldson	1,200.00
. Case	19.00	Henry Dodge	375.00
Comstock	41.25	Dennis Driscoll	152.00
s Castle	120.00	Lucian Duprar	10.00
Conliff	40.00	Armor Dugar	21.00
kkin	41.00	Wallace Daykin	34.67
Condon	21.33	P. Digman	165.33
Conrad	7.50	George Durmett	1,200.00
Cushing	7.31	Jos. H. Durkee	518.00
Clear	80.00	Charles M. Doty	538.00
uk	51.00	Thos. H. Dougherty	361.50
Carroll	152.00	Patrick Dalton	320.00
Cabell	15.00	John Debt	315.90
a	7.50	John Donohue	179.50
ello	19.00	Al Davis	15.00
nents	13.33	S. H. Dent	333.32
J. Campbell	720.00	C. L. Dimon	3.60
Curtis	177.50	A. C. Dean	1,324.95
Cabell	15.00	Thomas Dougherty	192.00
mazos	5.00	Thomas Donley	360.00
ndo Cazia	2.63	Fred'k M. C. Drews	10.00
Cazia	4.50	Harry G. Dennis	600.00
Callaghan	1.00	Howland Dailey	540.00
k	99.00	Jas. Donnelly, sr	540.00
astner	2.50	J. T. Dailey	15.00
t Caro	37.50	John De Doner	32.50
ney	6.00	Charles Davis	17.00
nn	4.80	D. H. Doty	60.00
arter	7.35	Michael Driscoll	720.00
Cullen	7.50	A. M. Day	28.00
Collins	39.00	E. P. Durbrow	360.00
lifford	21.00	Sim Douglas	360.00
le	18.00	Henry Daly	1,200.00
J. Denn	660.00	Wm. Delaney	1,200.00
as Dunbar	151.33	John W. Duncan	186.67
Dykman	440.00	W. F. Dunn	33.33
Deaton	309.00	R. W. Doyle	177.50
Dresher	525.00	F. E. Dealing	400.00
V. Duvall & Co	40.72	T. L. Doolittle	186.00
I. Dallaghan	300.00	A. G. Dahl	250.00
B. Duffy	1,000.00	G. W. Dickson	540.00
Dickson	180.00	Dommick	41.70
Dale, Jr	900.00	Dah-ke-ya	37.45
el Durand	420.00	M. Dodden	95.65
J. Dormer	1,000.00	J. Dunkin	90.90

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
R. Davis	816.60	John Doran	96.28
W. Dean	3.40	Thomas Duger	7.00
John Doran	72.15	John Davidson	60.00
William Deerr	9.45	G. A. Dalimore	8.00
Thomas Davaney	172.47	Christian Dipp	150.00
Maurrice Donovan	91.62	John Dixon	77.00
William Darmer	4.20	E. B. Douglas	154.00
George Davis	180.00	John Donnelly	31.00
W. H. Donthat	1,400.00	R. H. Drummond	275.00
George Dalton	10.50	Herman Dienst	45.00
John A. Drew	780.00	John Devoe	15.00
Peter Duffy	660.00	Henry Dodge	7.20
Richard Dalton	540.00	W. F. Dobbin	60.00
William Dunn	317.50	Thomas Depue	80.00
Edward Dee	22.00	A. Decker	18.00
Jules Denegre	1,000.00	B. Davis	14.33
James D. Denegre	900.00	M. Duncan	2.00
John H. Douglass	335.00	S. Davis	19.20
John Daly	388.50	F. D. Dunn	9.56
James Daly	240.83	A. S. Dunn	9.56
William Daly	193.00	H. Debro	7.00
James Diggs	11.67	W. Davis	14.00
C. W. Dougherty	1,200.00	I. N. Demming	1.25
Wm. H. Davidson	795.00	James Doran	14.25
L. W. Duggan	150.00	J. L. Edwards	350.00
Michael Donohue	840.00	George Edwards	400.00
Gates Dixon	396.00	Joseph Ellis	360.00
Frank Dougherty	186.00	Alfred Eveleigh	141.00
R. A. Dore	809.00	Edward Ervin	37.50
C. Dye	53.50	Wm. H. Egan	71.66
Peter Day	70.91	W. Englehart	294.00
Carey Dye	49.25	A. C. Emerson	408.33
John Dailey	37.50	George Ehrler	10.00
Minor Dodson	33.75	William Eggleston	25.44
William Dodson	25.00	Chester A. Egbert	6.00
Wm Darr	5.94	Charles H. Egbert	291.67
Henry L. Dawson	196.00	A. W. English	54.25
Charles E. Davis	400.00	Chris. Eskseon	5.00
Amos Dickinson	6.00	John Edler	900.00
Augustus R. Duble	1,400.00	Henry Eckert	525.00
L. C. Douglass	720.00	John Enger	27.50
Thos. Donohue	840.00	Branlie Elias	160.00
W. A. Dorsey	200.00	Charles Eads	960.00
Daniel Dwyer	476.00	J. O. Eckles	100.00
A. L. Donaldson	960.00	E-span-ache-tha	3.00
Frank Douglass	45.38	Erirgnio Estrada	33.33
Geo. M. Diffendaffer	1,000.00	L. C. Easton	960.00
Henry R. Dibble	1,000.00	Jos. G. Edwards	960.00
John A. Dean	1,800.00	Charles Ellison	900.00
Henry Dearnley	1,200.00	F. M. Eddins	480.88
J. B. Daugherty	720.00	J. Egel	61.25
Thomas M. Durr	490.00	J. A. Eastman	25.33
J. D. Delonry	18.00	Gustav Eggers	119.44
J. B. Davidson	30.00	Myron Ellis	217.33
Rob't De Marr	210.00	M. F. Ellrich	1,600.00
Curtis S. Doak	27.50	John Eddings	1,000.00
D. H. Doty	254.00	W. H. Eddings	610.00
Dropped on it	45.00	John L. Ehlam	540.00
James Daly	30.33	Gus Engel	900.00
W. J. Dunn	50.00	Ear	6.00
J. F. Daily	28.00	Richard Eldridge	5.88
Dutchy	4.55	Grant Eastin	15.00
Leonard Dodge	14.00	Peter Eskald	174.00
Jack Duval	66.00	J. F. Eickhorst	480.00
P. D. Darby	3.00	Raymond Empson	400.00
Oliver Davis	70.00	Gus. Ellis	6.00
Ira Derousie	5.00	D. Edwards	18.00
O. Donehoo	1.00	John Erlandson	282.54
B. Dunkin	13.35	Gust. Erstrom	8.14
T. Davis	6.50	Charles Earnshaw	43.60
C. Davis	32.70	Joaquin Esport	10.50
Jim C. Dalzell	17.00	Frank H. Ewald	1,466.63
John Duffy	6.00	John Egan	182.00
Mike Dwyer	50.43	J. W. Edgerton	1,600.00
Joseph Dunn	15.05	Carl C. Ebensen	270.00
W. Dolan	1.58	G. C. Ebensen	35.00
Michael Donnelly	9.63	J. M. Edwards	60.31
Tom Dwyer	17.32	Henry Ensminger	28.75
M. Donoghue	25.00	William Ewald	1,800.00
Wm. Davis	13.82	Karl Esser	1,400.00
John Darley	13.82	Gilbert Edminston	29.00

n employés and the amounts paid to each during the fiscal year 1891 who are id from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
ldridge	$212.50	Charles French	$414.17
ilow	480.00	Boston Freeman	30.00
idgman	501.66	C. A. Forsyth	500.00
E. Enlow	35.25	Charles Falgout	60.00
immrich	1,600.00	Augustus Fox	600.00
l Engely	150.00	Church Foster	540.00
ı Elliott	15.00	Patrick Fitzpatrick	12.00
. Eveleigh	243.00	Joseph Fish	175.00
astin	25.00	John Fox	270.00
Erwin	252.00	Ransom Fry	720.00
eather	45.00	George Furnace	348.00
ler	32.67	Nelson S. Fickle	160.00
East	7.50	M. Flynn	480.00
baugh	28.00	Frank Frances	118.67
aton	32.83	Carl Finck	540.00
Evans	10.67	George W. Field	1,600.00
Eller	10.00	R. N. Flock	3.00
ans	41.67	Henry Falvey	720.00
liott	250.00	Charles Fox	465.00
Edwards	2.50	Frank Fox	49.33
	2.60	Alex. Frazier	197.50
lwards	121.00	T. B. Falcher	100.00
s Eaglin	60.00	Fire	32.50
dwards	9.63	Foolish Elk	7.50
ison	40.25	Wm. L. Flagg	975.00
ricsson	82.85	William Fry	360.00
Erb	15.00	H. Ford	192.00
zzell	6.00	F. Fearon	624.00
ldridge	240.00	J. Fry	30.00
dwards	3.00	Patrick Flood	540.00
iminston	33.00	Fogarty & Johnson	900.00
ston	12.75	Joseph H. Fleming	320.00
Fulton	900.00	Harry Forest	325.00
ulton	780.00	Edward Foley	360.00
ulton	339.38	Ed. Finley	30.00
ı Falvey	30.00	Fun	94.85
Fickel	455.35	Fatty	17.85
erris	1,600.00	B. Favors	16.00
Frost	600.00	F. Fletcher	3.00
ales	320.00	A. Favors	14.00
tam	257.25	C. Freeman	145.00
. Farley	1,800.00	S. Fletcher	5.28
. Fessman	92.50	M. Fleeman	4.80
ne	205.67	O. Foster	2.50
Fegan	33.00	John Folliard	15.97
entine	244.00	Michael Finnigan	109.65
n	488.00	Christy Fagen	11.38
awdrey	34.50	John Ford	150.00
ı Flanigan	370.00	Robert Furlong	600.00
isk	685.00	B. Figuror	10.50
. Fearson	8.94	Frank	3.00
	720.00	George Flint	655.00
ield	258.00	D. Figuror	10.50
eld	128.00	James Farrell	420.00
klin	40.09	James Feeney	1,290.00
Fease	20.00	C. P. Fogelstrom	357.25
ı Falvey	39.50	H. Ford	510.00
rnum	1,800.00	Frank Fuller	23.33
Frye	584.00	George W. Few	1,260.00
ierbaum	129.50	Frank Fisher	508.33
ranklin	359.00	George W. Fitch	60.00
ielding	30.00	William H. Freudenthal	1,800.00
ı Fuller	84.00	Frank O. Foster	900.00
Folkhard	52.50	J. B. Fehl	660.00
rley	1,800.00	Atlas Ford	480.00
reeman	1,400.00	John Flemming	495.00
man	150.00	J. W. Fields	24.00
Farley	50.00	Jacob Foster	36.56
. Farnsworth	100.00	George Funk	23.75
ı French	485.00	John Faye	720.00
D. Ford	248.00	Wm. H. Fales	670.00
arley	600.00	Thomas Fox	257.25
Forsyth	360.00	John Fitzgerald	540.00
Farrar	360.00	S. Farrell	753.00
Flores	25.20	Patrick Flaherty	480.00
Fiel	960.00	John S. Field	190.67
Flanagan	130.00	Sam'l E. Furnish	35.24
rd	1,600.00	Harry Franke	900.00
razier	75.00	Gennaro Faraco	132.00
leming	900.00	Thomas Foskett	17.50
Fishel	720.00	M. Fitzpatrick	7.50

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
Patrick Fahy	$122.50	John M. Gandy	$1,000.00
Thomas Falvey	120.00	Perry Getts	470.00
Dave Froman	21.00	D. U. George	420.00
John Fay	24.00	William Goding	1,500.00
Charles Fleming	130.67	J. Greenfield	480.00
Alfred Fawdrey	80.00	C. K. Gilson	114.67
John Floust	9.97	Robert Griffith	338.67
James Ferguson	9.33	A. M. Grover	112.50
Fast Whirlwind	15.00	F. M. Granbon	116.67
John Frost	8.36	John Grossman	900.00
Charles Friend	.85	E. Greenwald	75.00
John Fiscus	12.52	Owen Gallaher	7.00
F. Falvey	74.00	James Grogen	12.25
Mike Fisher	60.00	John Grab	12.25
James Fay	58.00	Jas. A. Gilmour	24.00
R. A. Forsythe	297.37	William Groseclose	30.00
George Fuchs	14.25	Gue-me-tha	2.50
C. W. Files	10.00	J. H. Gorman	132.50
M. Fannin	3.00	P. H. Givan	8.00
W. Folsem	6.20	F. W. Gibbons	304.50
Adam Flach	6.00	Peter Grimon	840.00
Frank M. Freeburg	9.66	T. C. Grover	1,200.00
John Fogg	21.25	A. N. Grover	541.44
James Flynn	43.31	Henry George	200.00
Patrick Fagan	61.07	H. C. Gharet	115.50
John Flaherty	24.68	Frank Gronard	1,800.00
Charles Fletcher	37.28	Fritz Gatle	15.00
Frank Fletcher	31.85	Frank H. Gonzaler	12.50
Andrew Frausen	44.54	Andrew J. Greenough	1,000.00
Frederick Frausen	8.31	John Garret	3.00
Thomas Ferris	1.40	Baptiste Garnier	720.00
Benjamin Ford	24.50	Frank J. Grodavent	1,800.00
Patrick Fitzgerald	3.50	Louis E. Goad	96.00
James Feenan	35.87	John Gibbon, jr	480.00
F. Finn	18.00	J. H. Garth	12.67
H. E. Field	222.25	Henry Gordon	114.66
J. C. Field	154.38	T. B. Glover	1,661.00
H. L. Field	150.00	M. H. Green	6.00
Frank	12.00	Thomas Griffin	840.00
O. N. Florine	84.92	F. A. Gates	468.34
W. D. Foster	26.00	Frank Garrety	420.00
John O. Flynn	48.00	J. G. Goselin	1,297.50
Max Fischer	26.00	Good Eagle	4.50
Charles Frazer	108.00	Ghost Bull	31.65
John Feikert	102.67	Graham, Parts His Hair	5.00
W. B. Finch	180.00	Charles Giroux	55.67
James Ferry	45.00	Will Goree	165.17
H. Fry	42.00	William C. George	5.00
Abe Fiscus	19.20	W. Grayard	720.00
Jake Foutz	4.80	J. Garvey	218.00
D. Fitzpatrick	225.00	J. W. Gray	180.00
J. Farmer	13.00	P. M. Geary	900.00
W. A. Graves, jr., & Co	30.00	James Groves	384.00
Calvin Goodloe	575.00	C. J. Green	300.00
Horace Grace	312.20	John Garret	156.00
W. M. Griffin	96.00	S. G. Gordon	200.00
M. Gainer	150.00	Oscar J. Goodman	900.00
Stephen George	12.50	E. Guard	720.00
C. A. Givens	12.00	Gay-die-kon	43.45
William A. Gorett	202.50	Go-not-tsis	11.90
John A. Galbraith	1,800.00	Gar-tsi-nasty	9.10
J. H. Gardner	900.00	W. B. Guimarin	1,200.00
John P. Goff	140.00	Joe Gilbert	7.70
James Gonder	40.00	W. Gilbert	159.21
M. Gilhuly	900.00	J. Glenn	116.67
M. Galloway	180.00	T. B. Goins	87.15
John Gamble	34.50	D. E. Gosnell	193.35
John Goll	499.98	W. Glen	7.30
Augustus L. Grimes	123.91	B. Glover	172.70
A. H. Gerlach	200.00	M. Gilbert	6.30
A Gudmendeen	420.00	J. A. Griffin	7.70
Daniel Gableman	75.83	W. Gaston	4.20
William H. Gaffney	115.37	William Goodhart	3.50
Nicholas Gaffney	129.20	Geo. R. Gooding	275.00
David W. Groves	480.00	Louis Gilbert	455.00
W. H. Gerlach	288.33	George	12.00
W. Gray	4.00	Edward Golding	741.00
M. Gorman	540.00	James Garrod	540.00
Charles Gunthier	6.67	John F. Goff	900.00
George Goller	370.67	Frank Guy	720.00
Max Goetze	265.00	P. Gillispie	360.00

...n employés and the amounts paid to each during the fiscal year 1891 who are ...aid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
. Graves	$89.35	C. H. Hart	$766.65
raham	84.00	A. Hill	460.00
m Gabriel	49.00	Henry Hilt	360.00
Gensler	480.00	Robert H. Hainz	246.00
. Gaw	55.00	Thomas Holley	305.00
Gresham	121.66	R. E. Horton	140.00
t Granger	480.00	I. N. Harward	140.00
k Grady	520.00	Henry Horton	360.00
ales	480.00	Geo. Hohregreen & Son	9.00
e Gulliver	34.68	B. F. Howells	30.00
s Gorum	37.50	J. A. Hadfield	1,299.76
Golman	32.81	C. Horseman	30.00
arland	900.00	Joseph Haire	23.00
Garvey	585.00	John H. Hilton	337.30
m Gavin	461.00	Albert I. Hilton	142.33
s E. Graefen	1,800.00	Geo. F. Hartman	1,600.00
. Grant	1,800.00	Peter Hellmuth	500.00
ray	604.66	Charles J. Hague	40.00
riffiths	113.33	Matt. Hampton	60.00
e O. Gill	37.12	William Hudson	90.00
. Gresham	413.33	William Hurst	80.00
Guest	135.00	G. W. Hollett	8.00
as Gilroy	900.00	A. C. Hayden	38.50
l Grannan	900.00	Willis Hisicire	161.66
r A. Gray	780.00	T. P. Hull	102.38
Gray	360.00	F. E. Hollerung	900.00
. Genvermon	720.00	J. Hass	420.00
m Getty	648.00	E. Haeg	247.33
Glosser	648.00	P. Hass	414.00
Gillam	648.00	W. Hartley	300.00
s Gray	1,200.00	W. Harris	720.00
s Guenther	648.00	Jas. B. Henderson	675.00
rick Glaze	24.00	John Hortzel	123.50
rd Garden	18.00	William Hager	720.00
llagher	133.40	Thomas Heslin	480.00
olden	96.00	Charles Hager	200.00
Green	220.00	John Hall	15.00
Gallineaux	62.50	Frank J. Hanshew	70.00
ry Three Stars	10.83	John Hainz	600.00
raham	10.21	L. H. Hugy	36.00
J. Glanz	300.00	G. W. Hartzell	1,800.00
Gray	240.00	E. A. Holritz	1,700.00
tz	9.80	H. R. P. Hamilton	510.00
gory	83.33	Miles Hinsen	420.00
Bruce Gove	64.00	James Hunt	387.00
assman	27.38	Charles Howard	288.00
Gibson	15.94	Frank Hodson	159.25
Griffin	75.00	Louis Hern	145.00
ffin	6.00	Eben Hill	25.00
nn	2.00	Geo. W. Harriman	2.75
nn	35.83	John Hodge	4.00
imo	17.85	John E. Hammon	720.00
nder Gamble	18.00	L. T. Hammon	438.67
Gamble, jr	26.00	John W. Horton	54.83
Gamble, jr	28.00	Ed. W. Henitt	1,609.00
t Gamble	26.00	Eugene Humbert	120.00
e Gamble	22.00	James P. Hannon	120.00
nayson	61.42	H. T. Hepler	337.50
unnarsen	61.42	J. Hurley	206.67
ough	12.25	Gabe Hayes	16.80
Gibbon	53.20	Grovener W. Haig	600.00
reen	59.69	Joseph Honmeil	18.00
reen	9.00	John H. Horan	560.75
orse	150.00	John Holly	8.80
rant	2.00	Julius Hayden	4.00
ay	83.33	J. M. Hansen	65.85
rier	7.80	John Holland	362.00
allen	150.00	Oscar Hotchkiss	62.00
umsolis	70.00	J. J. Halloran	130.00
W. Gaw	25.00	John Halloran	960.00
lynn	57.00	Fred. Hendrickson	98.00
m Glenn	20.00	Jas. H. Humphreys	1,800.00
onzales	19.50	Charles Hagel	5.00
lynn	27.00	Joseph Holmes	720.00
nroy	57.00	John Hughes	104.00
oodrich	7.50	William Harris	530.00
m Gray	96.00	M. L. Howell	755.00
reer	5.90	Henry Hunt	617.33
lover	20.00	James Hayes	420.00
reen	41.55	Albert Harding	420.00
Glazier	120.00	Patrick Houston	690.00

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
James Haggerty	$105.33	John Hamilton, No. 1	$104.43
Joseph Hinsley	188.69	John Hamilton, No. 2	19.51
Henry R. Hills	115.00	Anton Haufbower	38.24
James Hamilton	5.00	John Harper	217.95
Robert Hutchinson	1,380.00	Charles Harrison	67.48
A. S. Henderson	540.00	Paul Hanher	3.59
Henry Hildebrandt	960.00	Clint. C. Harlan	9.63
Charles Henser	24.00	Patrick Higgins	75.87
Chas. R. Habermas	14.00	John Hastings	31.50
Patrick Hickey	1,000.00	George Hansen	11.37
William Hart	600.00	Oscar Holmes	69.89
John Hoschett	600.00	William Henn	36.95
E. E. Hay	3.00	John Hammer	78.46
G. W. Hardee	9.00	John Haisch	39.64
L. B. Herrington	660.00	Thomas Hunter	10.41
F. G. Harris	900.00	Hugh Hartman	1,650.61
Chas. L. Hilbert	1.00	Frederick Hoss	540.00
Dock Haley	227.50	F. H. Harberg	175.00
Wm. Heberling	360.00	C. W. Hatfield	171.67
E. C. Hawkins	20.00	B. F. Hartler	24.00
Henry Hensley	420.00	A. Hanandes	3.00
J. L. Higgins	37.50	P. Hanandes	3.00
F. C. Hyde	720.00	Daniel Hurley	684.00
J. F. Hutchens	720.00	Bridget Howe	36.00
J. J. Healy	519.82	F. Hastings	720.00
W. H. Hosack	1,800.00	John Higgins	360.00
F. A. Hosack	720.00	Wiley Holland	587.00
C. A. Homan	14.00	Jacob Harris	270.00
Mary Hubert	15.75	Albert Hoysler	540.00
H. M. Harndon	1,040.00	Peter Harris	18.00
H. Heitman	960.00	John Hoysler	15.00
Patrick Hughes	178.25	W. Hohmeyer	241.00
Benjamin Hughes	133.75	W. A. Holbrook	23.00
J. Hillman	720.00	C. Healy	95.17
John C. Hughes	1,600.00	H. L. Hurley	35.00
H. W. Hoover	1,100.00	M. Hessian	322.00
L. A. Humphrey	319.99	A. Hering	500.00
Phillip Handschuh	600.00	F. L. Hunter	1,500.00
Anthony Henvel	525.00	Walter Hart	60.00
J. A. Henderson	296.33	Thos. A. Hawley	5.00
M. Howland	1,800.00	Valentine Hill	359.00
J. D. Humphrey	385.01	William Hart	1,800.00
F. H. Humphreys	1,800.00	J. F. Hurley	600.00
Hand Soldier	19.50	Michael Hagen	454.67
Henry Herring	52.50	J. C. Hardie	1,600.00
Oliver Hillman	23.33	Ed. Hoffman	15.94
A. F. Hay	20.00	Henry Hawkins	28.75
H. Houser	900.00	Wm. Henson	79.62
J. G. Hewett	900.00	Henry Harris	83.74
C. Hatfield	96.00	Ben. Hill	14.37
W. H. Holbrook	232.00	A. A. Hines	76.86
John Hart	320.00	Henry Haskins	16.25
Geo. W. Hill	66.67	A. G. Hayes	36.75
Ep Haskins	360.00	A. Hammerson	69.11
James Hunt	75.00	Joseph Head	6.25
Henry C. Hyatt	131.00	John Hurley	18.75
Tin Hallahan	720.00	C. Holmes	1.25
J. Hultz	720.00	Ruffin Holmes	12.19
W. H. Holbrooks	25.00	James B. Hodges	1,400.00
Wm. Hunter	225.00	Michael Hogan	730.00
Joseph Held	345.00	Jos. Higgins	780.00
A. B. Hammond	234.00	T. T. Hunter	794.00
Maurice Hazelmayer	660.00	Frank J. Hogan	540.00
Ha-o-gans	8.05	John M. Heisler	444.00
S. Hardin	300.00	Theo. A. Huey	1,400.00
D. W. Henderson	241.67	Harry Hoole	540.00
M. Hill	27.00	Henry J. Homann	3.90
M. Henderson	13.90	L. B. Holabird	1,200.00
L. Hedgwood	35.15	Martin Heberick	480.00
J. Howard	11.00	Wm. Howard	840.00
W. Howard	14.16	Jno. W. Hendricks	480.00
M. Hollis	10.83	Arthur Howard	11.62
W. Henson	70.35	John Halloran	700.00
E. Holland	92.75	Chas. L. Herrmann	1,600.00
P. Harbuck	217.40	Henry Hart	960.00
M. Howard	19.89	Theo. M. Hart	1,600.00
L. Hudson	7.30	Alfred Hurst	500.00
H. Hopgood	6.80	Joseph Horay	648.00
Wm. Herman	70.34	E. Hefferman	840.00
Carl Hungren	467.90	Theo. Howeler	50.37
A. B. Holabird	1,100.00	Henry Hewitt	15.00

ın employés and the amounts paid to each during the fiscal year 1891 who are aid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
ton	$192.50	Fredk Hilt	$41.00
lurley	65.33	Doe Hill	15.00
Hudson	240.00	John R. Haynie	9.00
ealy	255.96	B. F. Hurt	88.00
Hidden	20.00	F. E. Hartshorn	84.50
Bear	45.00	H. B. Hartshorn	84.50
of Buck Elk	45.00	John Hammes	65.00
Harris	61.83	David Hoffman	60.67
k Hart	14.00	Chas. Harry	12.50
Hurley	49.00	H. Havery	6.00
rell	35.00	W. H. Holmes	14.75
Hainor	48.00	F. Healey	16.95
rd	13.00	Lyman Hall	253.50
Man	13.00	Henry Hussey	15.00
I. Hilton	300.00	Frank Hass	22.35
rd J. Heaney	128.00	W. H. Harrison	8.70
Hoover	40.00	Harry J. Homann	1.15
Harris	30.00	George Hall	2.50
m Hopley	53.02	Joseph Hall	4.50
m Hall	100.00	R. E. Henderson	87.50
ardman	58.00	J. Hutchinson	50.00
al	70.00	William Itzin	98.00
Hart	84.00	Edward Inbody	480.00
e Hart	74.00	Jacob H. Isler	900.00
Hoxby	36.00	George Irwin	5.00
Hinkel	22.00	Daniel Ickes	5.00
Higgins	8.00	Richard Ish	480.00
Hart	66.00	Iron Horse	32.50
gings	50.00	J. Ingraham	11.50
	10.00	Frank Inman	1,800.00
owe	3.00	Henry Inkman	720.00
Hoyt	9.00	Blair Ingalls	1,200.00
Harnish	3.00	George Ibers	45.00
Hoyt	10.50	Wm. R. Irving	600.00
Hudson	20.62	Iron Wing	45.00
Hayes	24.00	Isaac Parts his Hair	9.58
. Holm	8.00	James Irwin	200.67
S. Heivner	33.25	J. E. Irby	22.50
ı Hensley	160.00	Harry Johnson	169.00
Harris	7.50	J. H. Johnson	10.00
enibuch	13.75	Robert Johnson	18.00
pital	6.25	S. P. Jefferson	1,080.00
Hone	64.50	Hans Jepson	136.10
m Hall	130.67	Chris Johnson	36.00
htower	4.20	Andrew Johnson	123.80
milton	2.60	T. L. Jones	930.00
rrison	4.60	L. L. Johnson	960.00
liday	63.83	Peter Jansen	76.50
ris	4.95	Joseph Judge	18.00
Harris	360.00	Arthur J. Judd	200.00
Hunter	93.00	Ben Jeckel	62.00
Holla	50.66	James Joyce	500.00
Hogan	46.37	William Jackson	900.00
Hoffman	41.30	Silas Jones	1.25
Hughes	32.29	James T. Johnson	720.00
e Hogan	25.20	Charles Jenkins	300.00
) Hoff	1.05	S. Jacobson	666.64
Havey	1.75	Ferdinand James	900.00
Higgins	17.32	Joe Johnson	480.00
Havsen	15.57	T. H.B. Jones	1,800.00
el Horan	7.87	Chas. A. Johnson	420.00
S. Howe	186.10	Wm. N. Johnson	280.00
Herrick	21.00	A. Jennings	1.50
Harris	29.17	Peter Johnson	1.50
ı Heid	103.33	Jas. H. Johnson	1,457.21
. Holmes	10.80	Henry Janis	25.67
Hinmon	2.50	Willie Janis	25.67
e Hammond	102.00	Anslem Jackson	41.33
n Hjal	81.00	H. P. Jones	1,200.00
Haney	3.00	A. W. Jones	327.00
Hoggerty	70.00	J. C. Johnson	480.00
Houston	311.32	C. E. Johnson	200.00
ı Holmes	18.00	Jim	23.30
Holmes	34.00	Jalsanny	45.55
	1.00	Juan	45.50
Haenselmann	12.00	Juacinto	23.10
ley	17.60	José H	66.95
Hughes	49.00	G. Johnson	46.95
Hogan	46.00	A. Jackson	17.85
Hodgkinson	123.00	W. Jenkins	81.20
Hartley	45.09	—— Jackson	9.60

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
W. Jones	333.20	John Kiernan	1,440.00
J. Watts Judson	1,333.30	Frank Keegan	34.00
Mamie Judson	135.00	William Krider	1,200.00
August Johnson	91.00	Rich W. Kelly	7.00
Andrew Jacobson	116.54	Albert J. Klare	387.50
John Johnson	70.95	Oscar Klare	68.13
John Jeffrey	1.56	Andrew Katri	900.00
Chris Jensen	1.75	Lyman Keech	241.30
Peter Johnson	74.81	Henry Kirkham	210.00
Josa	9.00	C. E. Kohler	696.00
Josa Juan	9.00	Frank Kohlert	.75
Jim	7.50	Jacob Kroll	7.50
L. P. Jensen	18.00	J. W. Kennedy	300.00
Hans Johnson	1.50	Wm. Kirtland	300.25
J. W. Jones	42.00	P. H. Kuhn	1,800.00
Marie L. Jordan	4.00	W. R. Kenny	2.25
John Johnson	48.00	Frank Keeley	1.50
Thomas Jones	540.00	J. S. Keese	95.00
Robert Jordan	24.04	C. H. Kamm	720.00
Peter Johnson	29.69	Peter Klein	300.00
John Jackson	30.31	Thomas Kerrigan	780.00
Solomon Jackson	24.69	Peter Kelly	126.50
John James	13.12	William Krichelt	1,800.00
John Johnson	3.44	Benjamin Knapp	10.00
William Jackson	1.25	Henry Klein	324.00
Jno. R. Jennings	1,316.69	James Karnahan	163.75
Chas K. Jacoby	840.00	Frank Kehr	90.00
W. G. Jamison	200.00	M. Kavanaugh	28.00
Wilson Jones	960.00	William Klotz	48.00
W. H. D. Joyce	6.50	John Kean	6.00
Harlan Jenkins	60.00	P. Kostar	55.00
Jesse James	12.80	Ed. Kelton	75.00
Edward Jannis	8.00	Frederick Kruger	1,800.00
J. C. Jones	24.50	R. S. Kinney	500.00
Geo. F. Johnson	204.00	William Kitsch	300.00
Frederick A. Johnson	118.66	Wm. Kirtland	333.33
O. H. Johnson	6.00	Daniel R. Kline	754.15
Wm. Jackson	8.25	P. Kinney	480.00
Aug. Jemmer	24.87	Dennis Kennedy	200.00
Wm. N. Johnson	35.00	F. W. Klopfer	56.00
A. D. Jones	24.75	J. P. Keller	1,069.98
D. S. Jocelyn	148.00	Charles H. Klein	108.83
H. Johnson	3.85	W. S. Kelly	301.33
L. James	5.60	H. Kehl	7.78
M. James	14.85	Malachi Kerwan	480.00
Frank Janey	8.75	Kill-Above	5.63
Swan Johnson	34.12	James Kimball	150.00
Frederick Johr	4.20	Fred Klusman	21.00
J. W. Johnston	29.17	Joe Keonig	22.50
W. F. Jackson	114.00	William Keith	68.00
Frank C. Jones	26.00	Felix Kahn	80.00
Charles Johnston	24.00	E. L. Keyes	5.00
Warner Johnson	52.20	J. Krouss	360.00
J. N. Jackson	17.33	J. Kemble	100.00
A. F. Johnson	53.25	John Kelly	720.00
G. Jonas	26.00	John Kraus	900.00
Bodo Jonas	22.00	John Kirley	900.00
M. D. Jordan	5.00	J. M. Kirley	276.67
Jake	160.00	James Kelley	360.00
W. C. Jones	9.00	Kay-dic-tash	9.10
J. W. Johnson	76.00	Kay-its-tach	17.50
L. Johnson	6.00	Kay-dach-zinne	37.10
Thomas Jones	24.00	Ky-zha	27.05
W. H. Johnson	1.00	Ka-ah-te-nay	32.55
D. B. Knowlton	207.50	Kay-sh-tah	36.05
A. B. Kauffman	948.00	W. H. Kemp	296.00
Henry Keller	200.00	S. Kennedy	56.05
Willie Kitchen	12.50	P. King	11.60
Henry Kitchen	12.50	J. Knott	113.66
Geo. K. Kosters	450.00	W. Kennedy	112.56
A. J. Kerwin	37.00	O. Kemp	78.33
John Kabitz	720.00	Elels Knutson	173.35
Wm. S. Kline	128.50	John O. Kelly	1.75
P. J. Kavanaugh	60.00	N. Kelly	.88
M. D. Kavanaugh	100.00	Chris. Knaak	11.20
John Kerr	600.00	John Kirk	330.00
Wm. J. Kipp	882.50	A. W. Kimball	1,016.65
Hermann Kunarth	382.50	Ed. Kern	600.00
Ernest Kimme	600.00	Martin Kelly	1,400.00
H. L. Kyne	86.20	Anthony Kehoe	900.00
Ed. C. Knowlton	750.60	Stephen Knapp	75.00

an employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Departmen—Continued.

Names.	Amounts.	Names.	Amounts.
' Kendall	$720.00	A. Lapp	$357.00
an M. Kerr	1,200.00	R. F. Lord	600.00
ohler	84.00	William Langton	420.00
' Kreiger	455.23	S. J. Lillie	1,200.00
ight	60.00	Herman Lehman	1,200.00
s Kramer	405.00	Richard Lynch	330.00
h Kingsley	66.00	John Loughman	32.00
l Kernes	10.00	E. Y. Lansing	1,800.00
' Kline	47.19	William Lucas, jr	900.00
e Krouse	16.25	Richard Levill	420.00
: Kennedy	25.94	Patrick Leary	900.00
Knapp	1,200.00	J. Lundin	96.30
. Keller	600.00	W. G. Linner	5.00
R. Kelly	600.00	J. F. Leonard	725.00
Kane	1,038.00	George Le Comb	720.00
rd J. Keating	780.00	Charles D. Lewis	60.00
. Kemble	858.00	Oliver P. Lefferts	14.00
Keill	48.75	Geo. M. Lake	106.67
m Kelly	648.00	George W. Lehr	120.00
Kulicke	1,200.00	E. E. Lincoln	933.33
Kennedy	720.00	Antoine Lorendo	180.00
rd Killion	720.00	Ed. Lyman	68.00
uhlman	648.00	J. H. Luders	770.00
Kirk	180.00	Charles H. Long	780.00
w Kolezar	30.00	Howard Lampman	180.00
Klaus	375.00	Oliver P. Lefferts	94.50
s Kunz	45.00	Carl Leider	398.00
Kaiser	21.00	Louis Lancher	2.00
Keese	41.00	J. F. La Fourette	526.00
nan	45.00	E. Long	452.38
p	26.00	John Lawton	100.33
t Katscher	33.33	Pierre Lier	50.48
Kirkwood	50.16	Nichold La France	13.50
m Keith	18.17	Charles Lawton	480.00
Kimes	34.00	Majer Lambert	480.00
as Kelly	74.00	Patrick Lawler	540.00
Kavanaugh	60.00	John Lee	80.00
lly	112.00	George Lee	720.00
Krattz	85.16	A. G. Livingston	56.33
W. Knight	173.33	E. B. Love	420.00
dler	18.00	Edward Lyon	227.50
W. Keith	249.00	J. C. Lawton	595.75
Knowlton	28.33	Perry A. Lyons	1,000.00
h F. Kelly	270.00	John Lewis	195.00
el Kelly	14.17	Ed. Lyman	6.00
Kinney	4.38	P. Larney	216.00
k Kelly	35.09	B. N. Leverick	960.00
h Kellar	8.75	J. A. Leathers	440.00
Kaliher	48.22	Charles Lee	568.00
s Kelly	2.50	Horace Ludington	1,800.00
Kelleher	6.38	Nils Lyon	720.00
ahney	20.30	Ed. Lerrig	1.50
Kenny	4.00	Charles Little Hoop	19.50
llen	15.17	Little Cloud	17.33
L. Kiser	60.00	John M. Lewis	141.66
s Kerr	10.00	Burt E. Loomer	21.33
Keiningham	18.00	Jesse Leonard	28.00
t King	78.00	John Lamb	24.00
h Kern	79.90	Lea Lavelle	360.00
m Klaus	26.00	Daniel Lynch	480.00
Kern	22.00	T. M. Linnemann	720.00
Kinney	260.56	Lah-tsi-nasty	27.65
Keinningham	18.00	W. Lawrence	64.17
Kirk	128.50	V. Lyons	18.80
Kizer	16.00	B. Lewis	2.90
King	4.35	S. Lewis	5.00
Knight	50.75	E. D. Lashley	174.92
Kane	87.50	Millard Larrison	82.83
. Lambert	620.00	Charles Lundgren, No. 1	211.15
e Lough	96.00	Charles Lundgren, No. 2	143.11
e Loring	1,320.00	John Leece	.88
Loring	480.00	Andrew Lawson, No. 1	13.12
J. Lee	420.00	Andrew Lawson, No. 2	69.69
r Loring	900.00	Daniel Lorigan	38.48
k Lunny	600.00	A. E. Lynch	720.00
R. Lloyd	105.00	Ed Lupton	600.00
P. Lloyd	173.33	C. Leroy	12.00
Lepper	6.50	Indian Leire	9.00
Lyttle	10.00	S. Lopes	10.50
Long	390.00	J. M. Lorand	8.25
tian Laudener	360.00	Indian Lewis	3.00

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
A. G. Lyons	$1,600.00	E. J. McGuirk	$730.00
Michael Ledwidge	720.00	John McGuirk	624.00
Mathew Lennon	360.00	Geo. F. Mizen	225.00
Wm. G. Loring	1,320.00	John Meyer	540.00
Walter G. Loring	32.50	N. J. Merriam	900.00
Frank Lambert	90.00	J. H. McLaughlin	300.00
E. Logan	360.00	Robert Morrison	90.00
J. B. Loyd	1,800.00	M. E. Munson	16.00
Frank Lochboehler	840.00	J. B. McKenzie	168.00
Dennis Lynch	540.00	Michael Moloney	228.00
W. H. Lomax	480.00	P. J. McDonald	605.00
Albert Lee	480.00	Peter McGrath	469.00
Thomas Lawson	480.00	T. McBride	177.00
Bud Long	29.37	C. Masoero	287.75
Austin Lewis	13.12	Geo. H. Mortimore	300.67
James Lamb	38.33	William Moulton	3.00
Thomas Lynch	1,200.00	T. Morgan	420.00
Lomis Luetge	780.00	W. Meichel	420.00
Ed. Leonard	534.00	Joel Moran	1,080.00
J. J. Leech	596.00	E. F. J. McCarthy	195.00
John C. Loomis	210.00	Jule A. Mason	44.00
T. E. Longden	1,800.00	T. M. McMahon	750.00
U. B. Louis	1,600.00	John Mercer	720.00
Susanna Llewellyn	322.00	J. Moran	420.00
Ed. J. Lieniz	720.00	Otto Meder	720.00
David Lindsay	720.00	Henry Maher	42.00
John Layer	648.00	Martin Maloney	129.50
David J. Lucey	1,200.00	Theron Maynard	900.00
John C. Lockhart	540.00	M. J. Maloney	840.00
Jos. Lannigan	264.00	D. E. McCann	58.50
G. C. Lemmon	5.00	J. Mitchell	420.00
Cyrus Lawrence	9.75	John J. Midgley	351.00
Wm. Loughman	150.00	J. B. McMillan	39.00
Long Bull	5.63	J. H. Mulany	96.00
Little Hope	13.00	Charles Morris	10.00
Lone Bear	13.00	W. O. Marbel	96.00
Lot Eyelash	4.90	B. M. McGee	42.00
L. Leal	74.00	E. F. Murchy	1,200.00
Chrs. Lundgren	10.33	John Mason	420.00
George Lowell	27.00	Edwin A. Morris	420.00
Louisiana Lopez	35.00	R. McFall	161.00
Christian A. Lazarus	175.00	James Mooney	8.00
F. J. Logan	9.75	G. W. Marsh	132.00
Charel Lankrist	33.25	John Mortel	365.33
Isidore Laleman	33.25	Bent Moore	70.00
Eugene Lucas	2.50	Theodore Millett	494.00
W. R. Lee	26.00	J. W. Mars	70.00
Patk. Lorimey	12.25	H. McCoy	420.00
Patk. Landy	12.25	John McMurray	450.00
Patk. Lawler	41.30	John Mullen	100.65
John Laney	11.55	John McCray	191.10
Sandy Larson	5.95	Robert R. Milligan	276.67
S. Larson	17.32	Wm. McFadden	360.00
Thos. Lowry	10.50	John McHugh	69.00
John Lowry	108.00	W. D. Moore	6.00
Joseph Lawless	38.00	J. H. Murphey	500.00
George W. Ladd	62.00	Robert Mitchell	495.00
Clement Laws	80.00	E. A. McCoy	150.00
Thomas Lee	116.00	Alex. McMichael	152.00
Cyrus Lawrence	26.25	E. B. Markley	40.00
C. J. Langholz	7.50	R. B. Maley	720.00
Geo. A. Lough	45.00	Ida A. Merriam	42.75
Isaac Levy	.50	W. H. Mitchell	23.33
M. Leonard	128.00	Peter Malloy	113.33
L. Luke	5.00	M. Moran	66.66
W. Lewis	12.00	J. H. Miller	22.00
N. Love	14.90	Hector McDonald	13.00
Henry Lacy	15.75	Harry Miller	93.66
J. Lamb	24.00	Jos. McKinney	260.33
T. Lacey	18.75	Alex. McMichael	270.67
Fred. Maynard	1,283.35	Fred. MacNutt	360.00
Frank Murray	1,283.35	J. W. McMillen	288.00
J. M. Maltsberger	365.00	S. Martinez	1.80
William Miller	360.00	J. Martinez	1.80
D. W. McKillip	637.50	John McDougall	864.00
P. McNeill	144.00	W. S. Morgan	1,403.63
William Mathews	12.50	E. G. Mills	130.00
Thomas McGuire	360.00	Geo. H. McMillin	60.00
P. J. Murphey	43.00	George Miller	34.00
Thomas McGrath	1,020.00	C. H. Markham	450.00
R. M. McPherson	276.94	Thomas Morris	188.42

employés and the amounts paid to each during the fiscal year 1891 who are d from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
Marcinski	$62.50	William McPherson	$135.00
H. Marshall	135.33	Hugh Maguire	1,000.00
cGowan	1,400.00	Willis Maxfield	335.00
urphy	160.00	F. U. Martin	310.00
artinelle	192.00	D. P. Marum	900.00
Minacco	140.00	A. McDonald	60.00
Connville	490.00	Martine	22.30
Murray	660.00	Mith-to	18.10
	4.75	Mangus	36.40
Carty	19.50	R. Mitchell	360.00
E. Mack	2.50	J. H. Moore	4.90
cCarty	200.00	W. Mitchell	107.23
Metcalfe	960.00	L. Miles	23.00
Miller	382.67	E. Morgan	2.90
Massette	900.00	J. Moore	116.25
1	6.00	B. Moore	106.66
oore	360.00	L. Miller	5.00
Iartin	96.00	D. Mitchell	2.55
Mobley	480.00	B. Myers	4.00
Iartin	85.33	G. McCreary	.50
yer	476.00	Charles Mulinair	122.50
aley	224.00	George W. Marshall	7.04
Iartin	35.00	Asbury Millson	12.30
Miller	80.00	Aleck Merrival	38.00
Alpine	78.50	James Mahany	13.47
Manuel	6.00	James Milkelson	14.00
axey	240.00	Byrne Merwin	38.40
Martin	900.00	Barnard McWilliams	6.90
cCool	480.00	Max Mulash	116.46
IcFarland	245.00	David Moore	2.80
McFarland	350.00	Ed. Mountain	12.95
IcFarland	60.17	Jas. McGann	4.82
oore	330.00	Wm. McLaughlin	82.60
IcBride	385.00	Charles Miller	8.23
Donald	960.00	Levi Miller	159.00
McHale	237.33	M. Martines	13.50
ppleton	453.33	A. Marquis	10.50
Montgomery	900.00	G. Martines	10.50
McLeran	480.00	R. Mendoza	10.50
Donald	11.00	Lewis Morales	10.50
McKinnis	562.50	Manuel	3.00
filler	24.00	M. H. McKillip	86.00
lligan	24.00	Ed. A. Murray	120.00
T. Milligan	28.00	Owen Murphy	420.00
orris	200.00	M. Moran	210.00
IcGinnis	720.00	John Mayes	640.00
Maury	40.00	W. J. McDonald	540.00
McEnry	40.00	Robert McWilliams	540.00
cGinnis	320.00	Martin McLoughlin	456.67
McCarthy	96.00	J. W. Marlow	253.00
Manning	48.00	W. B. Mattoon	284.00
loyer	938.67	T. Mack	86.00
cGuigan	800.00	John McGuinness	35.00
Cullom	185.33	F. B. Martin	30.33
McClarty	26.67	H. M. Mathews	90.00
ina	7.50	J. D. McGrew	30.00
Moreno	40.00	Michael Moylan	540.00
McGoldrick	540.00	Stephen McClure	340.00
honey	1,600.00	James McDonald	180.00
cDevitt	572.20	James W. McDonald	240.00
Magrane	1,600.00	F. W. Matteson	1,600.00
Murphy	1,200.00	Charles E. Miller	1,600.00
ce Mangan	900.00	Thomas McCabe	780.00
McMillan	420.00	L. B. McEntyre	840.00
odie	900.00	A. McKenzie	70.00
Mulcahy	1,200.00	John T. Mount	48.00
Meyers	420.00	Robert Miner	60.39
ll	1.50	Agnes McCabe	30.00
Miller	600.00	R. McMurray	317.11
e Elk	6.50	J. Marcy	36.75
Iathew	32.50	J. E. McIntosh	30.62
adison	78.00	Edward McIntosh	48.12
cGraw	155.00	Deskau Monroe	63.43
. Melrose	250.00	F. M. Mortimore	26.25
Miller	360.00	Roshar Marcey	41.56
atthews	60.00	Geo. Mortimore	38.43
Grew	233.00	T. F. Moriarty	30.62
oore	1,600.00	Henry Mortimore	6.87
ıir	600.00	Ed. McLaughlin	1,400.00
Mooney	650.00	Henry Murray	720.00
lrose	566.00	Michael McGrath	113.22

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
Thomas Moore	$396.00	J. R. McKinley	$40.00
Robt. J. McEnany	1,800.00	Frank Moore	30.00
Wm. Meniges	547.75	W. W. Montague	60.00
Henry Miller	540.00	W. Marcy	10.00
Emil Muench	1,000.00	Geo. W. Munkres	30.00
James Miles	102.00	Chas. A. McComb	140.00
A. Montandin	1,800.00	A. McCoy	33.00
John Morrin	720.00	J. Mosley	11.50
Thomas Meynell	798.33	G. Matthews	4.50
Joseph Miller	200.00	H. Moore	5.50
Peter C. Martin	480.00	D. Morgan	1.65
Peter Miller	480.00	W. McCoy	1.70
Hugh Mitchell	480.00	Thos. Murphy	21.25
William Morris	540.00	W. P. McHugh	60.00
Edward F. Miller	6.37	Patrick Magner	105.00
L. A. Mann	1,800.00	W. S. MacHaig	20.75
L. L. Moore	1,200.00	Nelson Mowers	5.00
James H. Myers	960.00	Sim McConnell	111.30
Geo. K. Morgan	480.00	Alex. McNamara	77.65
Enoch Maney	480.00	L. C. Mickle	30.00
Charles Main	6.00	Luke McDermott	24.22
Nathan W. Manning	720.00	Thomas Murphy	11.92
John McCarthy	10.50	Ed. McGinis	25.65
Sam'l McLaughlin	200.00	Thomas Morgan	12.86
Grant McEnany	1,200.00	Peter McCaffrey	7.70
John Madden	53.40	T. Masterson	60.57
John M. Mitchell	900.00	Patrick Morgan	53.91
Wm. Stanton Macomb	999.96	Peter Melmugrer	44.54
James Markward	720.00	Thomas McDonald	37.57
John McCullough	720.00	James Morris	44.97
Hugh McManus	648.00	Thomas McCann	48.65
Edward McCormick	648.00	Wm. Murphy	46.57
James A. Markey	648.00	Matt Murray	30.00
C. E. Miller	1,600.00	Patrick Murray	32.05
Thos. H. Maginniss	1,400.00	James Moran	42.17
James McKinley	840.00	John McDougall	43.30
Joseph C. Miller	540.00	Lawrence Miller	16.35
Wm. P. Mulherin	79.20	George Mullen	21.70
H. McDonald	55.00	P. S. Murray	1.75
George Miller	53.00	Patrick Murphy	13.82
T. C. Meckel	33.00	Andrew McManus	1.75
F. J. McConville	180.00	John McCahy	13.13
William McRoy	600.00	John Miller	1.75
Homer Morris	34.00	Patrick Monoghan	31.50
Jos. McLaughlin	84.33	Patrick Moragan	25.02
Jas. McDonald	105.00	James McDonough	2.00
John Mahoney	24.00	W. P. McFarland	50.00
Thomas Maloney	54.20	T. P. McColley	114.00
James Mooney	33.83	Louis Merrard	127.50
R. M. Morse	187.50	David McKay	173.35
John Mummert	266.67	Jesse Moore	95.00
Edward Miller	61.75	Harry McFarland	46.67
Elmer Miller	61.75	T. B. Myers	2.00
Wm. H. McGlinn	240.00	Thos. McCarthy	9.29
Hugo Miller	162.50	Theo. Muck	1.91
Henry Murray	467.79	John W. Merritt	62.00
Joseph Murray	30.33	Bailey Maddison	75.00
W. J. McWilliams	18.67	Alonzo R. Milligan	16.00
Frank McCormick	43.17	J. H. Miller	65.00
John McGuinness	50.17	Hugh Moffatt	68.00
F. A. Martin	35.00	Lawrence Madden	120.00
Jos. Marchall	4.00	A. J. McGuire	135.00
Ira Melvin	31.50	Peter McKay	90.46
Peter Murtough	2.00	M. C. R. Meyer	72.00
A. Miller	270.00	J. A. Miller	22.50
James Moran	17.67	Otto Mescke	43.35
Sim. McGonnell	3.00	A. C. McCarthy	9.90
Pat. McGinty	175.67	J. A. McLean	60.00
Wm. D. McConkey	223.33	Henry Mitchell	120.50
W. W. Miller	123.33	A. J. Murphy	47.00
T. V. Mahavier	74.00	Donald McIntire	1.00
S. H. McCormick	66.00	M. McCarty	15.00
Ira Miller	64.00	Arthur Modesti	.60
Frank Market	20.00	Richard Marsh	120.00
John McKinney	20.00	H. H. Mitchell	99.00
T. Middleton	14.00	J. F. Marvin	87.00
F. S. Macombe	3.00	James Martin	148.00
D. McGraw	3.00	J. S. McLary	13.00
J. S. Miller	3.00	C. H. Myers	31.05
A. M. Modisett	15.00	Henry Mayer	45.00
John McCall	12.25	William Meyer	16.00

n employés and the amounts paid to each during the fiscal year 1891 who are id from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
riwether	$28.50	James Nixon	$35.79
chell	13.50	James Nolan	1.75
oy	17.60	J. Nugent, jr	6.38
itz	54.15	John Nolan	2.45
ller	86.67	Sam'l Nelson	25.67
Miller	15.75	Neuls Nelson	52.50
chant	8.10	T. J. Newman	70.00
artin	2.25	Chas. Nelson	54.00
McKee	16.00	J. Nelson	60.00
Mulligan	66.00	J. W. Newton	35.00
ory	16.25	Norman	4.00
fansfield	16.50	J. H. Nelson	19.95
ay	37.50	T. Nolan	20.00
cNaughton	11.12	Henry Nolan	120.00
Cartley	10.68	Andrew Nickens	14.62
lixon	12.50	J. A. North	33.00
Norton	360.00	W. F. North	54.00
ber	600.00	Dennis O'Brien	360.00
Nagle	435.66	Rody O'Mara	440.00
Nelson	360.00	H. Otterbein	840.00
ikolas	260.40	E. L. Oakes	75.00
Jeriru	1,200.00	John O'Brien	89.48
ewell	720.00	Henry C. Owings	360.00
favarre	390.67	Michael J. Oates	265.00
Nisbett	18.00	William Oldenburg	562.50
olan	1,600.00	W. E. Oertle	3.50
Nanck	333.33	Edward H. Offley	1,424.97
rick	4.50	W. D. Osgood	256.67
Nebrick	91.20	Richard A. O'Brien	825.00
elson	720.00	M. E. O'Connor	5.00
Mabell	360.00	Thomas O'Mara	720.00
Niemeyer	14.00	Peter Olsen	16.50
ewman	960.00	H. Otterson	78.75
Newton	65.33	Charles Oliver	420.00
Nelson	29.63	Thadeus W. Odell	609.33
ell	150.00	H. J. Olsen	234.20
Nagle	30.00	John O'Neill	197.67
Neeley	300.00	Henry Ory	934.50
Nelson	.75	David Orrock	27.10
Nolan	298.00	J. E. O'Flaherty	12.00
ice Noonan	124.00	J. M. Ormsby	196.67
North	297.50	A. C. Osterman	1,800.00
n Nelson	1,800.00	One that stands first	15.00
d Nicklas	600.00	Tim O'Connell	240.00
ewcombe	66.00	Pedeo Olsen	150.00
elson	275.00	Hugh Owen	298.67
Noyes	50.00	W. Owens	103.32
Northup	52.50	S. Oliver	172.91
	100.45	T. Oliver	32.60
	10.85	Mangus Olander	131.07
	45.50	Charles Olsen	52.71
-ah-gahm	29.00	John Olsson	98.74
-zin	52.15	Louis Okirson	74.65
	38.85	E. Olea	12.00
t-zherggi	17.50	M. Olea	12.00
ion	5.50	R. Ocho	12.00
th	2.80	A. Ortego	10.50
Nichols	570.00	John O'Ryan	1,600.00
olan	189.17	W. O'Connell	84.00
Neff	1,244.41	Ab. O'Keffe	207.33
Nelson	30.97	Michael O'Mara	360.00
Nugent	124.51	James O'Brien	360.00
Nelson	103.33	Jerry Overton	47.49
Nass	4.20	Thomas Owens	47.49
in	6.00	George Ozleton	35.31
Nielson	306.67	T. Owen	10.62
Nape	572.00	James Overton	49.68
kerson	33.12	George Overton	9.69
Nourse	36.88	Rich. O'Shanghnessey	23.75
Nitzel	7.50	G. W. O'Shaughnessey	37.50
Nourse	45.00	Geo. F. Otis	1,600.00
Newman	15.50	George O'Hara	12.00
ton Noble	620.50	Isaac Onyon	1,600.00
Northcutt	785.00	Martin O'Dea	461.25
ewman	37.50	Owl King	45.00
Noble	1,700.00	George Owens	29.17
Nelston	5.00	B. O'Beirne	213.00
ll	8.55	Patrick O'Donell	101.33
Needham	675.00	P. Olson	6.00
s C. Noblit	15.00	George Oberly	6.87
Neilson	76.20	H. Osborn	22.95

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
C Oatley	879.60	Geo. J. Pitfield	81,400.00
John Oleson	110.77	Perico	75.25
Sue O'Kersen	95.90	S. Pittman	31.10
Chas. O'Brien	42.56	G. Perdue	14.16
Frank O'Brien	15.05	C. E. Pullins	168.00
Chas. Olsen	10.59	A. Payne	34.20
John O'Mara	1.75	T. Patterson	13.00
Edward O'Neal	19.00	Peter Powers	56.24
A. S. Olsen	72.00	W. E. Palmer	600.00
A. Olsen	6.00	Frank Pierce	343.13
Patk. O'Donnell	76.00	Geo. W. Peachy	21.70
Wm. Owins	36.00	J. Paras	12.00
James Osler	64.50	José Pares	18.10
Frank Oskar	30.00	J. W. Payne	709.16
A. L. Oliver	26.10	Thos. E. Padden	720.00
H. T. Oliver	23.40	H. O. Pelton	45.00
Alexander Pope	1,533.32	W. Peal	291.10
Theo. Pattmen	480.00	H. M. Pierce	173.33
Alex. Pollock	1,293.35	E. T. Price	1,200.00
Mitchell Porter	12.50	G. M. Pettit	216.00
A. Parker	12.50	George Pettit	110.92
Dan'l Pratt, son	2.00	Gibson Pelham	14.25
Hugo Paeske	346.00	Berr Perry	54.00
Frank Proctor	8.00	Charles Pin	26.24
M. J. Piercey	1,200.00	Jesse Pollard	1.25
Fred'k Phillips	420.00	Thomas Pace	18.00
Edward Peterson	34.20	Henry Pettit	6.75
J. F. Perle	720.00	James Peacock	1,140.00
Oli. Paulsson	300.00	Wm. A. Pinn	472.00
H. W. Packwood	8.00	E. G. Powell	109.25
James Powell	488.00	Magnus Parsons	552.12
Gibson Pelham	86.56	Wm. E. Prescott	1,600.00
Amnon Pollard	86.56	James M. Parker	480.00
D. Phelam	1,400.00	C. Peterman	900.00
J. R. Patch	1,020.00	H. E. Parry	300.00
John Peterson	47.64	Isaac Parry	232.00
Jacob Peterson	51.60	John Palmer	850.00
N. Pettet	130.00	Jacob Pyle	515.00
A. M. Pettit	1,800.00	William Patton	540.00
A. E. Pettitt	666.65	Geo. T. Payne	9.00
Henry Patchin	1,600.00	Jas D. Phillips	160.00
W. Parker	360.00	Jas. R. Passoo	18.00
R. E. Patch	15.00	J. Patch	42.50
Jay Pittis	226.17	Pretty Elk	24.27
Richard Powers	960.00	Joseph Pablo	9.33
Smith Pryor	23.33	David Powers	30.00
Sam'l D. Phillips	420.00	Part Hair	13.00
S. J. Palmer	194.27	Pretty Jim	13.00
N. Poorman	720.00	John Phillips	40.00
Charles Pryme	1,600.00	A. Patzack	102.00
Peter Peterson	12.00	Thos. Pritchard	74.00
Emil Plunn	1,200.00	George Peeter	54.00
Edward Pratt	8.00	Judson Peeter	28.00
Jan Pettersen	40.00	E. M. Porter	133.33
J. D. Parker	7.50	O. L. Post	4.50
John Ponlson	366.00	Geo. T. Parker	5.50
William Pinn	240.00	David Paule	41.50
S. D. Parker	51.00	J. V. Pardee	10.00
George Perry	663.39	Daniel Pope	20.00
L. Powers	900.00	Robert Paul	6.75
Al. Page	420.00	J. Phillips	5.62
Charles H. Price	410.00	Dan'l Pearce	11.25
C. H. Pahn	200.38	F. Pollard	5.00
Wallace Powles	104.40	William Powers	160.00
James F. Pagan	900.00	O. Peacock	7.00
Emil Panly	364.00	John Polly	30.00
K. L. Parrott	174.40	E. S. Peake	80.00
Charles H. Petton	12.50	Gus Pearson	61.67
E. Premus	12.00	Pete Persson	59.67
Henry Premus	12.00	Robt Phalen	7.79
F. E. Pressler	1,400.00	John Pringel	14.00
E. W. Piper	1,800.00	Rich'd Peters	41.91
J. M. Pritchard	960.00	Dan'l Pendeyroes	3.50
M. Price	300.00	Peter Peterson	16.36
Theo. Phillips	720.00	J. S. Prall	10.41
E. A. Parmeler	1,600.00	Orill Paine	26.25
James Peterson	420.00	J. R. Peverette	22.22
John Park	270.00	Leo Pleins	133.33
Charles Provost	51.34	H. A. Pierce	33.00
Robert Parker	9.33	S. Patch	12.00
Jack Passoo	29.00	J. H. Page	300.00

n employés and the amounts paid to each during the fiscal year 1891 who are aid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
ɜtton	$26.00	Chas. A. Rohrer	$14.66
Pitzuch	33.00	J. H. Rassmerssen	12.00
ırsen	35.70	Charles B. Ross	10.67
Peralto	1.13	John Romonis	420.00
ıuliss	75.00	J. W. Russell	540.00
endergast	9.40	Charles K. Ramsay	75.00
Price	5.63	Julius Ripson	120.00
Perry	16.20	E. L. Rhyan	96.00
menter	3.60	C. R. Reynolds	1,600.00
ritcher	1.50	Henry Riegle	26.00
Peyton	3.12	Thomas Russell	480.00
epper	4.00	Fred. D. Roberts	152.00
ıuam	16 25	H. M. Richardson	200.00
uinn	720.00	Chas. M. Rennand	1,200.00
Quick	72.00	H. Rissi	420.00
Quinlan	64.15	W. S. Robinson	152.00
uinn	130.00	A H. Rawitzer	38.00
ı Quinby	38.00	Red Horse	19.50
Quinlan	1,200.00	Red Cloud	6.50
uinn	650.00	Real Bull	6.50
Quinn	35.79	Red Back	5.68
ıinby	11.75	Ed. Robinson	12.82
ruinn	90.00	Charles Robideaux	267.50
J. Riley	800.00	Frank Roush	8.33
oney	567.00	Thomas Roush	10.00
Rink	10.00	Wm. Reveler	720.00
ıssell	45.00	Frank Ross	360.00
Robinson	292.00	James Reynolds	126.00
. Richards	200.00	D. Remington	360.00
. Renz	420.00	C. E. Rand	289.00
afferty	480.00	J. W. Robinson	1,800.00
ush	1,500.00	Geo. D. Ramsay	1,200.00
	960.00	John Rohrwick	300.00
ı Ray	150.00	Wm. Rowland	900.00
ı Rial	1,000.00	Thos. Russell	360.00
ıtenbach	188.50	Alexander Robb	541.68
tenbach	76.50	Albert Rube	420.00
t Robertson	1,400.00	Ramon	42.90
eardon	900.00	John Russ	64.30
	690.00	J. Reynolds	35.70
es	70.00	R. Reed	7.40
obinson	350.00	J. Russ	45.00
ose	234.50	H. Rivers	19.50
teinkens	700.00	L. Riley	5.00
Ross	200.60	M. Riley	5.50
toberts	1,240.00	Mich Reagan	25.27
ichards	18.00	Patrick Ryan	16.00
Riley	960.00	Andrew Robinson	134.25
. Robson	76.00	Charles Riley	1.75
afferty	36.00	O. F. Reubendale	657.50
us Ryan	1,800.00	J. D. Reichert	167.95
	1,800.00	Ben. O. Rhodes	12.50
towlands	680.00	J. D. Robertson	78.25
s Riley	1,200.00	Indian Ramon	9.00
Rooney	466.00	H. M. Roberts	14.00
ı Russell	42.00	Louis Rogers	40.00
ısch	720.00	S. L. Robbins	1,449.96
ynolds	15.00	M. Reardon	624.00
ynolds	3.00	Richard Roonan	540.00
Rhoades	10.00	George Ross	325.00
odgers	720.00	E. D. Rhey	1,800.00
oth	900.00	Jos. Ritchie	35.00
oth	719.00	E. T. Ritchie	227.50
less	93.33	Harry Rehmeyer	40.00
Rafferty	290.00	T. E. Rock	7.75
M. Ringgold	101.33	P. J. Redmond	1,683.31
Royce	3.00	Michael Ruder	160.00
W. Ritzenhan	140.00	S. Ringlesby	720.00
Rogers	102.00	James Rourke	741.17
Reifenider	720.00	August Rhenold	185.00
riguez	263.66	Max S. Retter	516.00
eser	174.38	John Rider	480.00
chardson	77.25	John W. Ross, jr	215.00
itter	720.00	John Robertson	35.31
F. Russell	214.00	Thomas Ryan	1,600.00
eese	353.33	Geo. W. F. Randolph	1,400.00
othwell	819.42	E. C. Rankin	853.33
ussell	163.87	Stephen F. Rice	900.00
eamer	600.00	William Rohrig	77.66
Rinebarger	280.00	Guy G. Rodgers	1,200.00
eynolds	480.00	Robert Robinson	247.00

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
George Rider	$552.12	C. Richter	$[illegible]
J. P. Rice	1,400.00	Henry Sutton	1,000.00
James E. Ryan	1,400.00	Julius Schmidt	1,200.00
Geo. W. Rose	576.00	A. N. Shipley	100.00
John Ryan	480.00	Anton Seffel	365.00
Isaac Roberts	480.00	James Speers	720.00
William Reany	1,080.00	Harry H. Sterns	600.00
James Riley	7.00	C. H. Schlott	1,800.00
Richard H. Rush	1,400.00	Peter Schiffers	14.00
Charles E. Reed	1,000.00	G. Szartory	42.00
N. J. Rossiter	410.00	Edward Steel	900.00
J. L. Reese	1,000.00	Daniel Sullivan	300.00
Geo. G. Rossiter	648.00	Joseph Spohr	300.00
John F. Riblett	270.00	John Smith	720.00
John Raymond	509.40	Frank Stepp	36.00
W. K. Robinsan	648.00	William Stuht	900.00
Cyrus W Richmond	338.40	A. W. Spencer	3.00
Charles Rector	136.00	Jno. F. Sullivan	45.50
Red Bird	45.00	Ellsworth Shaw	304.00
Red Feather	10.83	A. G. Smith	114.20
Rockman	30.43	Noah Sumner	180.00
Red Breast	9.53	Justus Spindler	720.00
Harry Rehmeyer	35.00	James P. Smith	720.00
Stephen Reis	9.33	Peter St. John	900.00
William Rope	7.80	Henry Steen	1,400.00
Mike Keagan	3.00	F. H. Shaw	1,600.00
Amos Randall	30.00	Albert Stewart	51.00
John Riner	123.33	A. H. Stone	30.00
John T. Rigney	70.00	J. B. Stone	34.00
Ernst Roberts	58.00	A. E. Stevens	436.67
W. H. Ritterbush	10.00	William Stokes	37.63
Stephen Reis	250.00	J. Small	35.00
D. H. Reynolds	234.00	M. H. Solomon	696.00
C. Barnwell Robinson	500.00	C. A. Stein	62.50
Christian Russ	331.88	Jos. H. Slavin	1,600.00
R. B. Reynolds	174.67	W. Seidman	60.00
V. Ricks	6.00	Thomas S. Sweeney	714.00
D. Riggins	66.25	Charles Stevens	6.00
Frank Rogers	60.00	Louis Sweeley	900.00
John J. Rink	15.00	G. A. Smith	221.65
Ruby	17.85	James Stowe	2.00
G. W. Reeves	24.00	Thos. W. Sanner	1,800.00
Albert Ralstin	30.67	M. J. Somerville	5.00
Thos. Redmond	71.45	Gilbert Smith	1,800.00
John Roper	12.60	C. Small	51.00
C. A. Ralston	56.00	William Stokes	50.00
Michael Ring	22.75	Sam'l E. Shoemaker	570.00
Andrew Ralph	42.34	August Storz	900.00
D. Rowen	26.07	J. Scott	33.50
W. Rumage	3.33	Gabriel Sorkins	900.00
John Redmond	15.57	Clarence Sinks	1,200.00
Wm. Rohr	15.57	Frank Smith	160.00
Pat'k Reardon	13.13	Nicholas Simon	278.67
Wm. Rassu	2.10	George Stewart	76.33
Henry Robbins	11.90	Charles Stephan	316.67
W. F. Rowen	24.50	Charles Small	25.00
G. S. Russell	150.00	W. H. Stair	1,312.50
Harry Rehmeyer	70.00	Frank Sly	480.00
A. Ringston	17.00	A. Stewart	60.75
Wm. Rodgers	.60	W. B. Spenlock	900.00
Jonathan Roberts	97.16	C. Schmidt	480.00
James Reynolds	66.50	James Stewart	960.00
Rob't Raymond	104.00	G. W. Schreiner	120.00
Wm. Russell	102.00	William Smith	10.00
Anthony Rice	78.00	H. J. Shook	108.33
Henry Rice	72.00	O. R. Stone	247.12
E. V. Reynolds	69.60	George Scott	720.00
Chas. Redding	50.00	S. J. Shaw	339.50
J. J. Ramsey	110.00	John Stedifer	480.00
J. F. Rigney	90.00	Edgar Shelhamer	375.00
Thos. Russell	90.00	B. T. Smith	160.00
Jack Rooney	120.00	William Stillwell	480.00
P. Ryan	90.00	B. Stillwell	225.17
Frank Reese	8.00	R. Seymour	100.00
Wm. Reupsh	25.00	D. C. Sypher	1,200.00
J. F. Roney	49.20	William Swanston	720.00
E. Ramsey	8.20	C. Stevens	126.67
Fred. Radcliffe	24.15	M. Strahan	45.33
John Rosch	23.10	F. M. Sackrider	258.75
W. Rooney	3.60	A. L. Selber	322.50
A. Rhodes	8.62	Julius Simons	720.00

...n employés and the amounts paid to each during the fiscal year 1891 who are ...aid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
Snyder	$150.00	Singing Bear	$5.63
...g	240.00	Charles Saxton	56.16
...pson	147.00	G. A. Stannard	98.67
...Stofen	1,600.00	J. A. Smith	9.33
...m Sanders	840.00	R. Seymour	277.76
...m Stark	840.00	J. W. Stratton	23.99
Stofen	840.00	Charles Stolz	23.99
...Smith	28.00	John Short	22.66
...Smith	900.00	Allen W. Smith	92.50
Stone	280.00	Frank M. Steward	20.00
Sample	50.00	George Sykes	101.00
...on Sims	45.00	John Shea	900.00
Shepard	480.00	Quigley Smock	320.00
Smith	739.49	Frank Smith	720.00
Sucker	245.00	S. R. Smith	960.00
...pe	9.00	Louis Souenson	480.00
...Shoup	4.67	Wm. Stewart	720.00
Stine	20.00	C. M. Stevenson	274.00
...cheifer	1,200.00	T. C. Slemmons	151.00
...mith	2.00	W. H. Smith	44.00
C. Shipp	60.00	Frank Smith	20.00
...erick	169.00	J. W. Stout	1,187.50
...s J. Stein	900.00	G. E. Shepherd	27.50
...nklin	360.00	Spitty	35.70
Smith	50.00	Ira M. Swartz	1,050.00
...ken	494.00	J. W. Shy	13.00
Stockton	5.00	C. Sterling	9.20
Shinn	720.00	M. Simmons	3.80
...lupe Sarnz	240.00	J. H. Stirling	5.00
...e Slack	1,000.00	W. Sims	55.50
J. Spratte	480.00	H. Sanders	9.17
...chmidt	1,600.00	G. Smith	189.60
...ommer	1,200.00	J. Simpkins	28.60
Seivel	600.00	R. Stamps	9.00
...kelton	720.00	J. Stokes	19.15
J. Smith	560.00	Z. Smith	4.80
Smith	535.50	M. Sims	17.30
Sill	44.35	J. Smith	17.30
...tearns	3.75	B. Sharp	2.80
J. Short	52.00	J. Sewell	11.20
...atton	720.00	J. Strickland	2.50
...Sponseller	894.00	E. Stout	25.75
Smiley	87.50	C. W. Stewart	64.79
...s Scott	60.67	James Swisher	245.96
...m Shepherd	180.00	Charles Sprague	6.00
...n Stone	176.00	Frank Sprague	5.00
...canton	480.00	Charles H. Smith	80.00
...Smith	200.00	James Sullivan	129.98
...linger	200.00	Carl Swanson	260.14
...s E. Smith	814.65	James Sweeney	17.50
...H. Shaw	336.00	James Sheridan	22.50
...iker	32.00	Andrew Simmergren	26.10
...y Salls	440.00	O. C. Simonds	360.00
...l Schriver	180.00	John Swenson	147.94
Stendle	240.00	John Sheehan	163.33
...Sullivan	740.00	A. J. Sanborn	26.60
...Selzle	840.00	G. Stromer	4.50
Scanlon	420.00	W. B. Scarborough	2.50
...tian Selzle	480.00	Conrad Sales	9.00
Sheedy	420.00	H. Swift	12.00
...chous	1,600.00	R. Sarton	10.50
Smith	1,000.00	Thomas Stiner	4.00
Scott	720.00	Walter H. Smith	1,400.00
...e J. Stoney	1,400.00	August Schleese	1,783.33
...Sally	420.00	Charles Stem	180.00
...Smith	50.17	Frank M. Smith	720.00
Sykes	35.00	Charles Snyder	600.00
Sykes	291.67	Paulina Seidenkronz	120.00
...l Seeholm	1.50	Charles B. Schmidt	1,600.00
...Smith	1.50	Eugene Swan	480.00
...on Sines	124.50	H. Spenlock	120.00
...el Smith	30.33	G. Stafford	388.50
...d Elk	6.50	Cyrus Severance	12.83
Eyes	19.50	James M. Smith	54.16
...g Bear	6.50	Corson T. Smith	54.16
...ng Bear Gro	19.50	W. H. Smith	58.33
...ng Bear	6.50	Richard R. Shomes	93.34
...Horse	6.50	Rufus Slaughter	11.67
...n Close To It	6.50	David M. Stuller	225.00
...ng Bear	5.63	W. T. Sheehan	69.00
...ng Wind	5.63	Olney B. Stewart	400.00

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
Louis Smith	$1,025.00	A. A. Schwerin	$84.00
F. Schneider	1,095.00	James Spicer	12.50
Jas. Stapleton	350.00	A. Saunders	14.05
Walter Stack	360.00	Otto Schons	100.00
Charles Snyder	290.00	Carl Silberman	16.00
L. P. Smith	1,200.00	H. J. Sutton	440.00
John Swaine	64.00	Shooting Cat	5.83
Silas Snooks	88.42	Samuel Simmons	10.00
Wm. H. Sibley	92.50	Mateson Symonds	27.00
J. Samuel	1.25	Francis Smith	12.50
N. S. Smith	.94	T. M. Showalter	108.42
Hugh Seiberg	1,800.00	Thos. Sweeney	13.74
Alex. Sutorius	1,200.00	James Steadman	40.35
Eliza Skinkle	360.00	Fred. Schader	44.01
C. M. Strader	1,013.33	E. Sullivan	33.33
Frank Shulz	467.25	Eugene Schonberg	22.75
John Smith	83.00	Patrick Sullivan	17.06
J. R. Spahr	1,800.00	Gast Schnell	1.75
Wm. Strauch	481.00	John Skidmore	3.50
Mathias Sauer	280.00	Solomon Savage	40.25
Wm. H. Shaffer	720.00	T. F. Shufflebotham	25.00
J. A. Sage	900.00	B. Shields	18.00
Thos. E. Spence	480.00	F. H. Scholing	150.00
Henry Schwarz	1,400.00	E. Shafer	225.00
Geo. A. Snow	1,800.00	D. S. Sperry	.60
Sam'l Sherman	720.00	A. D. Smith	107.35
Geo. W. Smith	720.00	John Schultz	6.75
John Schmid	720.00	Louis Smith	5.25
Otis Strummel	675.00	J. A. Smith	5.25
Henry Strump	1,600.00	John Swartz	105.00
John J. Strader	2,000.00	Jordan Stone	180.00
Chas. C. Stringer	900.00	Fred. Smith	9.00
H. C. Spalding	900.00	J. H. Smith	87.00
Jacob Seger	648.00	J. C. Skidmore	105.00
Charles T. Schively	648.00	A. Swaine	72.00
J. W. Shearer	680.06	John E. Spillane	170.00
John Smith	117.00	F. B. Smith	26.85
Hugh Sterling	648.00	J. Swan	22.67
Jos. W. Smith	648.00	Louis Scott	40.00
John Scott	60.50	Amon Smith	90.00
S. E. Sterns	900.00	William Smith	9.00
Charles H. Smith	336.00	Thos. Smith	25.00
Louis Shangroix	282.00	John Schaeffer	95.00
James Shangroix	162.00	Olive Salinas	4.13
John L. Simmons	25.00	Adolph Sosr	12.50
J. W. Stattum	8.33	Henry Schief	900.00
William Simmons	21.00	James Seymour	1,600.00
John Short	172.00	C. K. Sims	60.00
James Smith	92.00	T. F. Smith	50.63
George Sutton	25.00	James Smith	4.30
A. Swan	63.00	G. Scott	41.20
William Smith	29.62	R. Settles	5.50
J. M. Stevens	40.00	J. Sledge	8.00
John Swan	8.00	Conrad Schmidt	21.90
C. S. Smith	224.59	Charles Shelby	12.00
Solomon Yellowhawk	45.00	Albert Stephen	95.00
Sitting Down Talking	45.00	Clinton Smith	200.00
Joe Silvas	9.53	A. H. Schanks	18.75
Shot in the Head	8.23	J. F. Sterling	16.50
Sunday Horse	.87	Thos. B. Travers	537.50
F. H. Shoeling	150.00	N. Torrney	720.00
W. C. Scott	11.67	Robert Taliaferro	1,020.00
Nat. Shaw	175.00	J. H. Tierney	864.00
Spot Horse	6.50	William Trout	396.00
Slow Bull	13.00	J. H. Turnell	12.50
Ed. Supton	31.67	E. L. Turner	12.50
J. M. Snug	8.00	L. A. Thompson	3.00
Julius Seebohm	310.00	John Taylor	208.00
Richard Smith	7.88	J. R. Truitt	14.00
Jonathan C. Smith	90.00	Chas. F. Trube	2.75
A. D. Smith	20.70	Joseph Tousaint	420.00
J. H. Schurmeier	104.50	James A. Thompson	355.83
Thomas Scott	1.25	Lawrence Trombley	33.08
A. Soto	.80	John Taylor	600.00
Daniel C. Swinbourne	144.66	Charles Thomas	342.33
E. J. Stewart	15.37	Thomas Twiggs	720.00
George Smith	14.33	Gunther Thompson	360.00
Sed-toe	16.45	Frank Tompkins	1,800.00
P. B. Seward	.70	Alfred Tedrow	317.33
John W. Sorrows	175.00	William Thelly	951.60
Charles Schlegel	30.75	Henry Tipton	697.50
John Smith	169.00	Zack Taylor	7.50

mployés and the amounts paid to eaah during the fiscal year 1891 who are from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
hrasher	$600.00	Taking Up	88.22
ilty	32.00	J. M. Tanner	31.50
onk	420.00	Buck Tolman	46.67
ert	400.00	Ross Tolbert	110.66
	360.00	Wm. Thompson	5.00
m	150.00	To Clanny	9.00
nas	720.00	Talbot Goodday	86.10
	83.33	To Karnny	5.25
Thomas	720.00	John M. Tucker	10.00
rth	480.00	Americas Thompson	52.00
l	108.50	J. W. Terrell	11.67
avers	110.00	P. C. Tracy	51.12
ishwan	1,005.52	Tasker Thompson	136.00
rexter	420.00	F. B. Tabor	6.75
iffany	420.00	R. Talbert	19.15
ett	1,200.00	Tzozonne	5.60
	720.00	George Tappen	16.67
Taylor	16.67	Frank Taylor	8.40
ney	123.50	Thomas Towie	58.44
hompson	600.00	Joseph Thompson	80.00
rozier	7.50	O. E. Tish	125.00
erman	837.33	J. L. Twohy	86.67
y	20.00	Robt. True	40.20
mas	25.00	John Tamplin	94.50
eryar	240.00	J. T. Taylor	8.85
son	480.00	Joseph Tapley	65.03
pin	360.00	L. M. Turner	132.00
lorse	6.50	O. F. Townsend	3.00
	6.50	A. Talbert	12.00
es	16.90	J. Unsheid	300.00
rs	32.50	John Urmphrey	27.00
ackett	804.16	C. J. Uthoff	1,600.00
	90.00	C. Ursprung	720.00
y	45.00	Fred. Upperman	420.00
npson	900.00	T. H. Upperman	1,400.00
	96.60	Jno. W. Umphrey	300.00
tos	96.60	Henry G. Unger	135.00
	36.05	John R. Upton	67.89
en	21.05	George Van Ness	370.00
	22.40	Louis Vogland	626.00
	129.30	S. H. Vansciver	200.00
	4.17	Wm. Vonder Bosch	1,800.00
ood	4.50	Louis Verwer	1,600.00
	40.83	William Van Scoy	466.00
	4.90	Michael Vice	365.00
man	64.17	Horace Vose	68.33
er	6.10	C. Volberg	3.96
pleton	560.00	Sabino Vallucia	159.00
wbridge	900.00	Eugene H. Vandenburg	280.00
nan	14.00	John Valerins	90.38
homas	600.00	And. Van Steenburgh	7.50
	90.00	C. Von Gansig	842.67
nsend	1,800.00	Zella Vespencia	19.87
nbull	1,600.00	E. Varney	44.00
pkins	440.00	H. C. Varney	44.00
nsend	102.00	Ed. Veitch	2.50
omas	22.19	James VanVlesk	1,800.00
rner	31.25	L. D. Vogal	1.80
orryman	16.56	H. Vallance	76.00
nas	7.50	John O. Vowles	720.00
ritt	720.00	Chas. Van Poughnet	133.50
olorhn	73.50	Chas. C. Vaun	21.00
mpson	1,800.00	A. J. Veitch	2.50
immons	1,200.00	Matt. Vaughn	42.35
mons	900.00	Michael Vaughn	26.16
otten	480.00	Allen Van Epps	68.00
hart	600.00	Harris Vase	78.00
pkins	100.00	Joseph Vrooman	78.00
en	1,200.00	J. H. Wharton	480.00
lor	1,000.00	Chas. Wentworth	360.00
Turner	840.00	George Washington	140.00
horner	720.00	Ed. Williams	66.00
ittle	516.00	E. A. West	75.00
mlin	145.00	Wirt & Hardy	2.75
ighe	648.00	Wm. C. Wetherby	1,800.00
tem	648.00	Henry Wache	1,400.00
Taylor	1,800.00	William West	140.00
mpson	1,200.00	C. Whitney	8.00
ale	720.00	Fred'k Wood	600.00
ott	45.00	R. L. Woolsey	1,600.00
ompson	37.00	Charles Webb	1,600.00
Lodge	45.00	Wm. H. Williams	1,600.00

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
Henry Werdman	$900.00	Stephen Washburn	$[illegible]
R. H. Whitehead	900.00	Edward Wilson	[illegible]
James Walker	90.00	A. S. Warren	75.00
R. B. Watson	960.00	A. Whyitt	85.00
W. T. Williams	1,202.21	Frank Willard	[illegible]
William Welch	960.00	R. R. Wilson	473.33
G. W. Wilson	960.00	R. H. Wilbur	1,[illegible].64
C. B. Whipple	600.00	J. C. Woodward	[illegible].99
Robert Ward	58.00	Granville Wade	15.75
Dan'l B. Wetherbee	1,200.00	A. D. Wood	[illegible].00
George Wagner	349.00	George C. Ward	1,200.00
Nath'l J. Wetherbee	720.00	John Wallace	1,[illegible].00
A. T. Wilson	1,000.00	Alex. Williams	[illegible].00
John Williamson	173.33	Wounded Foot	17.33
David Williamson	173.33	White Bird	16.00
W. Watson	105.00	Owen Whittaker	[illegible].00
George Walker	129.20	Henry Watkins	5.00
Charles White	20.00	Philip Wetzel	[illegible].00
Louis P. Wall	720.00	C. Wensler	[illegible].00
William West	120.00	Henry Whitted	[illegible].00
Barney Webber	90.50	J. R. Woodworth	[illegible].00
J. H. Williamson	720.00	W. B. Woodworth	[illegible].00
John Whitford	196.00	Geo. M. Wratton	1,[illegible].00
F. J. Walzer	5.00	Bob White	[illegible].25
L. C. Wells	843.00	T. S. Wilson, jr	1,[illegible].00
E. Wertenger	143.50	William Windle	[illegible].00
George Webster	106.00	W. A. Warner	[illegible].67
Ord. J. Wenchell	54.83	B. Williams	[illegible].00
E. F. Watson	737.50	G. Williams	[illegible].67
E. N. Wiest	722.66	J. Willis	[illegible].50
J. E. Wiest	1,200.00	J. Westley	[illegible].35
B. White	150.00	J. Washington	[illegible].00
Sam'l Williams	320.00	P. H. Wilson	1,[illegible].63
O. Williamson	12.00	Isaac Wright	[illegible].67
Charles Weidemann	312.50	Henry Wiedman	[illegible].63
Dan. R. Williamson	720.00	Bruce Winney	[illegible].66
Ed. C. Washington	522.67	Chas. L. Woodbury	[illegible].00
C. A. Way	55.56	Hammon Wigston	[illegible].64
Henry C. White	838.85	Patrick Welsh	[illegible].10
Edgar Whartenby	2.00	Andrew Wilson	[illegible].00
James Walsh	780.00	George Winters	[illegible].75
Charles J. Webster	900.00	Joseph Webster	[illegible].67
W. H. Woodall	130.00	William Ward	[illegible].13
J. B. Whittemore	1,400.00	E. L. Webster	[illegible].00
J. Worrell	350.00	William Weber	[illegible].14
W. E. Wade	78.00	A. Wahlman	[illegible].58
Charles Ward	100.00	H. R. Walter	[illegible].00
Henry White	1,200.00	J. L. Whitmeyer	1,[illegible].25
James Whalen	1,000.00	Frank Watson	[illegible].00
Stephen Williams	31.50	Geo. H. Wilson	1,[illegible].00
Oscar Welch	310.33	William Woods	[illegible].16
Frank White	175.00	O. H. Willis	[illegible].00
W. M. Wilson	96.25	Scott White	550.00
James F. Warren	132.13	Arthur Woods	[illegible].67
Harry West	50.00	Hermann Wolf	[illegible].39
A. F. Washington	350.00	G. Wilson	[illegible].00
A. K. Waddell	17.25	Louis Woerner	[illegible].00
A. Wood	11.00	J. H. Wood	[illegible].00
Wm. Wiegand	75.50	James Wheelen	[illegible].00
John Wilson	480.00	John Warren	[illegible].00
W. H. Wheeler	480.00	J. W. Wood	[illegible].67
A. S. Warren	1,400.00	A. Wells	[illegible].00
J. S. Welch	1,040.00	W. Wells	[illegible].00
Charles Wagner	7.50	William Weber	[illegible].33
John Wagner	7.50	B. A. Williamson	[illegible].17
Albert W. Westphal	91.00	Fred. Wambold	[illegible].00
Julius Werr	588.67	James Winnett	[illegible].00
Sam'l Williams	618.67	Michael Williams	[illegible].00
Albert Whipple	1,200.00	R. S. Wernway	[illegible].67
Albert Wetterer	650.00	John Jay Washburn	1,[illegible].00
P. A. Wells	595.00	John Wasson	[illegible].00
Andrew Wald	20.00	John J. Williams	[illegible].00
Jesse Wyatt	1,200.00	Wm. H. Walker	[illegible].00
A. S. Warren	720.00	J. W. Whipper	[illegible].00
Mary E. Walters	5.25	James Waters	[illegible].00
F. M. Werel	720.00	Augustine Watts	[illegible].00
A. A. West	940.00	Jim Washington	[illegible].62
Augustus Wagner	1,000.00	John Winston	[illegible].98
F. J. White	480.00	T. C. White	[illegible].62
J. J. Wintler	543.50	James Williams	[illegible].62
Wm. Wallenwever	14.50	Thomas White	[illegible].05
John W. Wentworth	26.50	S. J. Webb	[illegible].75

Civilian employés and the amounts paid to each during the fiscal year 1891 who are paid from appropriations for the Quartermaster's Department—Continued.

Names.	Amounts.	Names.	Amounts.
James Washington	$125.29	L. Watts	$79.80
Ernest Walker	38.75	H. West	9.50
Noah Williams	41.88	G. Ward	3.90
J. W. Wormley	41.56	John Walsh	46.37
John Ward	1.25	Theo Wicklander	85.05
C. V. Wilson	27.18	A. A. Wiltsen	17.00
W. E. Whitfield	1.25	Sandy Williams	6.00
Clarence Warwick	540.00	Jas. S. Wilson	16.00
Edward D. Wallace	900.00	Wm. Wood	80.00
Frederick Wimmer	554.12	Geo. Wiseley	205.33
L. C. Waite	1,400.00	T. Wagner	76.65
Chancellor Walls	540.00	C. C. Wilmore	21.90
Waldemar Wulff	1,600.00	F. J. Walzer	88.00
Ed. J. White	720.00	J. N. Williamson	18.00
H. J. Winne	1,600.00	R. S. Wentworth	49.00
Wm. Wilson	480.00	John Wyman	112.50
Jas. W. Wilkinson	480.00	Juan Wares	3.00
Geo. D. Webster	39.18	C. Weonesvalla	3.75
Charlie Wootan	13.50	F. H. Wiswell	54.00
J. Weyl	1,149.99	J. A. Wardrobe	150.00
F. D. Weeks	1,600.00	R. T. Whittlesey	35.00
W. H. Woodall	130.00	Wm. Wooster	36.00
Alex. Watters	720.00	John Wolle	25.00
Wm. W. Wade	13.75	C. Waters	165.50
John Walters	720.00	L. White	7.00
Charles Widdis	900.00	R. Windom	3.67
James Whyte	50.00	P. E. Weller	17.50
Chas. W. Woodward	720.00	T. Wilson	3.00
C. W. Walter	648.00	F. Walker	7.00
James C. Wilhelm	648.00	W. Williams	14.00
James Whitesides	540.00	Chas. M. Wild	29.33
Chas. Willerns	44.00	H. R. Walter	266.66
S. L. Wright	20.00	Frank Weaver	30.00
John Wilson	96.00	R. A. Williams	2.00
Harry Williams	72.50	John Young	456.00
Wm. J. Welsh, jr	72.00	A. A. Yeatman	1,020.00
Cal. Woods	21.00	Oscar Yerby	360.00
Stephen Williams	10.50	Wm. R. Young	300.00
R. Willis	50.00	Jos. R. Yingst	480.00
William White	18.00	Wm. L. Young	470.67
J. A. Wilson	42.00	Nelson Yarnell	674.00
E. Wamsley	50.00	R. W. Yeago	300.00
J. Whistler	10.00	H. P. Young	1,600.00
White Eagle	45.00	Thomas Young	11.00
Whetstone	11.70	Charles B. Yaw	720.00
Jacob White Eyes	9.53	Louis Yarnell	540.00
E. A. Walker	33.33	Thomas Yarnell	66.00
John Witt	33.33	D. W. Young	1,400.00
D. C. Wilson	28.00	John Yerak	338.33
C. F. Williams	87.30	Yellow Wood	18.63
A. L. Weidler	18.67	R. W. Yeago	104.00
White Deer	13.00	Ya-no-zha	31.15
White Eyes	2.79	P. Young	33.45
White Stone	13.00	G. Young	54.16
Wolf Belt	13.00	R. Young	8.80
White Bear	8.36	B. Young	2.00
R. T. Whittlesey	17.50	Yuma	12.00
James White	100.00	Levi Youngs	240.00
H. F. Wagner	28.00	Yellow Wound	11.70
R. White	16.00	Nick Young	45.00
Wm. T. Woodson	74.00	W. C. Yates	23.40
Henry Williams	60.00	Sam'l Younker	1.50
Chas. E. Wheeler	57.00	Geo. W. Zeigler	420.00
Richard Wilhart	66.00	Morgan C. Zeigler	255.17
Joseph Williamson	3.00	August Zimmer	39.70
Joseph Webber	6.00	Anthony C. Zbitek	29.17
John Walsh	22.00	C. B. Zinck	250.00
White Star	7.80	C. F. Zimmerman	900.00
Joseph Williams	7.50	E. W. Zahnutt	7.50
L. Williams	13.75	Zahnsh-ta-he	36.05
R. S. Windsor	1.50	Za-no-zha	23.10
T. Winters	1.25	Chas. Zimmer	3.00
John Wallace	39.00	August Zimmer	9.25
R. Wilson	2.00	Aaron Zweig	132.00
A. Woods	4.60	W. M. Zook	7.00
W. Warner	37.98	Phillip Zwerlien	241.75
Gus. Wheeler	4.60		
M. Wiley	12.15	Amounting in the aggregate to	1,264,996.87
W. H. Warner	18.33		

R. N. BATCHELDER,
Quartermaster-General U. S. Army.

QUARTERMASTER-GENERAL'S OFFICE,
December 7, 1891.

Statement giving the names of all civilian employés, and the amounts paid to each during the fiscal year ended June 30, 1891, who were paid from appropriations for the Ordnance Department, U. S. Army, in accordance with the requirements of the act of Congress approved February 24, 1891.

Names.	Amount paid.	Names.	Amount paid.
E. H. Carroll	$1,200.00	C. L. Turner	$327.50
Thomas Jones	1,194.50	William M. Blaine	305.25
Edward Hodge	129.00	John Driscoll	197.00
John Rockingham	102.00	Timothy Fenton	168.50
W. R. Carter	31.25	Thomas Griffin	138.00
John Cline	25.00	Michael Loftis	187.50
S. Boyd	25.00	John Fox	196.50
E. M. Aiken	17.00	John McBride	177.50
John Loresh	3.50	Wm. Rutan	2.52
Titus Berger	65.24	F. Brady	2.52
W. F. Eichenlaub	1.50	E. T. Armstrong	2.00
William Velte	9.20	Wm. Hughes	1.08
George Stewart	20.10	Hugh Daly	1.08
L. E. Haid	3.00	J. Coakley	1.08
J. B. Hill	2.00	J. Howarth	1.08
Chas. H. Egbert	1,052.85	J. McMullen	1.08
John R. Stephenson	1,028.56	John Young	190.00
Christopher C. Truitticher	710.94	Simon Houlihan	139.50
Robert H. Leckie	331.41	John McMahon	136.00
George B. Mountain	271.25	James Welsh	136.00
Richard Bennett, sr	352.18	James Reed	23.75
Patrick Sweeney	291.88	James Fagan	73.25
John B. Moore	22.88	Harry Glover	11.50
J. J. McKeown	4.12	Michael Welsh	28.50
Charles Hayes	198.00	Pierce Maher	238.00
George S. McNutt	160.94	Thomas Wade	70.50
A. Gettleson	1.50	James Manning	19.50
W. Edward Platt	13.50	Alexander J. Kerr	20.62
George R. Lombard	18.58	Francis M. Small	157.50
Charles J. Bischoff	111.00	John Ingram	34.00
Joseph H. Lamay	14.69	William Melrose	62.50
Thomas Harris	12.00	William Manning	34.00
C. A. Robbe	197.77	A. W. Howe	1.15
Robert Watkins	13.50	Ernest Kimme	10.50
F. E. Costello	75.00	Maggie Hart	9.00
P. J. Doris	25.50	Amy Binnington	29.34
Benjamin Brown	26.25	Maggie Edelsten	27.82
S. W. Williams	36.25	Mary Leidenberger	31.64
Jordan Potter	26.25	Jane Baker	30.00
Westley Warthy	38.75	Elizabeth Tully	30.64
John Wright	25.31	Margaret Colby	25.50
Robert Lawson	25.00	Mary Piher	23.50
Jesse Booker	25.00	Mary Jane Davis	27.50
Jefferson Booker	25.00	Lucy C. Justice	28.34
Denis Booker	25.00	Maude Dice	30.00
T. J. Sherman	23.12	Matt. F. Kippax	1,200.00
Daniel Settermire	10.00	Arthur Truscott	2,400.00
H. L. Thompson	1,600.00	Harry Peale, jr	353.34
C. W. Trumbull	1,200.00	Geo. F. Conant	1,560.00
G. H. Thompson	1,200.00	T. M. Voss	730.00
Edmund Richards	1,565.00	S. R. Woodruff	208.50
William J. Flannery	996.80	Frank Heide	6.00
J. O. Morgan	1,149.40	W. Niethus	6.00
M. J. Smith	77.50	Thomas Frierson	316.20
W. P. Lepper	95.50	D. W. Leneave	11.25
Joseph Welsh	821.25	A. Singer	24.50
Lawrence Fitzpatrick	624.00	Monroe Alford	5.00
J. M. T. Gregory	235.00	Thomas Baird	6.00
William Fox	624.00	James Barrett	6.00
Rufus O. Morgan	508.12	Miles Booker	6.00
George W. Pringle	971.00	Alfred Brown	6.00
P. P. De Marest	355.20	Hayes Brown	4.50
N. H. Garretson	593.00	John C. Brown	365.00
Gottlieb F. Schan	747.00	David Campbell	19.00
John Malone	399.50	Richard Cooper	75.50
Charles Vanes	476.00	Robert Douglass	19.00
Harry A. Downey	166.56	Thomas Frierson	41.25
William C. Clark	7.50	Thomas Frierson, jr	26.00
Luther Dinsmore	371.20	Jno. G. Heyenwald	26.00
George W. Leathe	671.32	Clinton Howard	178.50
William House	321.25	William Johnson	323.00
Henry Kirchner	52.00	Henry Jones	4.00
Robert Kearney	444.00	J. H. Jones	26.00
Patrick Fegan	348.00	Charlie Kirk Patrick	7.50
Frank Manley	88.50	Van. Lancaster	20.25
F. M. Hodges	47.00	Louis Patmore	6.00
Fred. Harkness	279.00	Samuel Pillow	5.25
George Fleming	664.00	Thomas Plant	58.75

nyés and the amounts paid to each during the fiscal year 1891 who were a appropriations for the Ordnance Department, etc.—Continued.

ames.	Amount paid.	Names.	Amount paid.
	86.00	Matilda E. Gilmore	358.43
n	6.00	Martha Ellison	314.88
	7.50	Sallie Holt	222.47
	6.00	Ella Johnson	304.28
	19.00	Anna E. Caldwell	291.32
	19.00	Sadie Cornell	221.50
	106.50	Theresia Immelt	293.76
n	1,200.00	Eva Moore	282.51
	626.00	Helena Corlon	280.87
	383.28	Emma L. McEwen	288.25
	396.16	Lidie Hennefer	293.16
	5.00	Annie O'Neill	256.39
f	547.50	Lizzie Neild	276.75
	489.37	Mary Guthrie	258.75
	41.25	Joseph G. Streeper	1,014.00
	147.50	M. Cleary	908.56
	60.00	James King	630.50
	7.00	Edward Walsh	611.50
am	125.50	G. Wernle	617.50
	18.00	John Shields	595.50
	6.87	John W. Thomas	602.00
	60.00	Lewis V. Willis	520.62
	39.37	John Jesberger	183.94
	1,200.00	Amelia Curry	311.84
	1,600.00	Mary L. Baker	253.55
	1,600.00	Mary E. Cleary	306.35
	1,600.00	Lizzie Deck	320.10
	900.00	E. Ellison	289.63
	900.00	Rachel E. Rodgers	199.00
	1,252.00	Hannah McMonigle	297.00
	860.75	Mary Biere	282.50
iz	782.50	Jesse L. Brass	1,154.53
m	704.25	E. Stackhouse	967.05
	652.00	Wm. Smith	945.79
	626.00	Wm. Wallace	493.75
	2,191.00	A. Stegmenn	1,170.00
	1,246.00	F. A. Stegmenn	781.81
	1,484.99	Wm. H. Weiser	525.44
	1,170.00	Edwin Knott	912.50
	1,025.50	Ellwood Roberts	628.05
	1,025.92	Owen Sheridan	490.87
	1,049.56	M. Arnold	900.00
	1,037.75	A. T. Bailey	730.00
de	1,076.22	J. O'Neill	730.00
	984.52	P. O'Brien	730.00
	1,041.50	James H. Eva	621.50
	1,047.34	Gabriel Ehmann	546.22
	976.21	Joseph Bilhartz	586.50
	972.91	Alex. Brandt	544.25
ll	935.91	John O'Brien	526.75
	936.00	Patrick Coleman	450.25
	928.74	James Fuller	465.75
n	12.00	Eugene Smith	270.50
le	892.17	Giles Craven	156.00
	712.75	F. T. Aitken	360.75
	737.71	J. E. Carr	1,014.00
	627.75	George Luddecke	908.00
	730.00	Charles J. Phillips	525.00
	622.00	Emma Williamson	367.34
	558.75	Annie W. Heyer	317.62
ins	618.75	M. J. Teas	318.58
	502.91	Kate Frayner	271.43
	587.22	Annie Sheridan	319.00
	1,248.00	Ida M. Arnold	307.91
	829.49	Lottie Getty	259.46
	732.18	Sallie Gosline	292.60
	598.50	John J. Bray	370.63
	604.50	Edward Kale	338.25
	523.89	M. S. Felleman	326.56
	518.65	Henry Patberg	1.50
	528.28	William Patberg	1.50
	493.34	Freddie Patberg	1.50
	366.25	John Camfield	1.50
	357.18	Frank Gilson	1.50
	351.60	Charles Persh	1.50
	337.70	George Earland	1.50
	328.07	Ben. Patberg	1.05
	317.20	James Kenney	1.05
	308.00	James Camfield	1.05
	316.93	John Hobson	1.05
	315.97	Emma C. Pugh	297.69

Civilian employés and the amounts paid to each during the fiscal year 1891 who were paid from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
Katie Weier	$274.75	Joseph Bradley	$6.00
Rose Smith	229.05	Banjamin Holeman	7.13
John B. Wilson	14.00	William Myers	7.50
Grace Shields	210.15	Francis Mullen	7.50
Wm. E. Brough	378.00	Richard Wilton	22.50
Wm. T. Burns	338.25	Edward Shobe	1,200.00
Albert M. Bates	225.50	J. J. B. Hatfield	1,252.00
John Martindale	558.75	C. W. Schreckengost	55.40
George Hutzel	269.63	G. H. Shover	8.25
Mary Jane Grant	158.50	J. W. Gilbert	20.16
Arletta Toy	158.75	C. P. Errott	31.00
Lizzie Bell	51.75	Eastman Schleicher	70.00
Laura Helverson	132.30	H. G. De Haven	55.25
Sarah Kroesen	131.85	Adam Griffin	36.65
John Dearden	143.89	Charles Kinsler	1,200.00
Thomas Corcoran	71.10	Orin Williamson	199.50
Fleda Crook	111.15	F. H. Beale	129.05
Jane E. Laurence	125.33	E. F. Blackman	92.50
Florence R. Streeper	131.96	J. H. Chander	53.30
Annie Toy	8.55	Simon O'Hare	45.00
Mary Schahl	134.89	Geo. Doughty	44.07
Blanche Murphins	135.90	E. W. Libby	41.25
Edward L. Butler	71.07	Amos H. Church	35.00
Chas. J. Fox	59.12	Jacob H. Goodrich	32.18
Jacob Wuerta	122.25	Chas. F Fletcher	25.77
Wm. H. Eppehemer	218.75	Frank O. Ward	16.00
C. B. Sowerby	407.00	Edward Pratt	14.80
Anna Webster	130.95	Chas. M. Sturgis	10.00
James Fisher	125.55	H. W. Lyon	4.10
Ethel Linn	124.77	J. H. Cogan	1.25
Amy Wennals	113.40	Wm. Walters	1,600.00
Bessie Vanhorn	123.98	Chas. H. Campbell	1,400.00
Anna McAnulla	103.39	M. E. P. Worth	28.00
Mary G. Letterman	116.10	Cora Smith	24.50
Annie Stanley	105.75	Frank D. Riker	1,200.00
Linda M. Davis	9.45	John Milet	730.75
Harriet J. Ford	141.50	Henry J. Trumble	699.63
Kate Taylor	143.00	Ernest J. Burgund	568.75
Frank J. Dougherty	125.21	Richard Seidel	214.84
Wm. R. Guthrie	110.26	Martin A. Johnson	466.34
Carrie A. Meyer	130.95	Chas. Van Etten	54.00
Mattie W. Teas	131.18	John Ferdinand	541.11
Linnie Smith	128.25	Frank Kahlmeyer	75.00
Ida Rich	127.35	Frederick Parker	7.50
Sam'l Getty	19.25	Henry Mebus	876.56
Fanny Snyder	144.63	Wm. Chant	59.50
T. Clark Walton	.90	Wm. J. Crehan	59.50
Joseph Wernle	283.75	Thomas Doyle	35.00
W. J. Wright	257.25	Edward A. Goslyn	56.00
Charles Strobel	332.76	Julius O. Hicks	163.00
Annie L. Davis	93.71	Owen McGreevy	54.00
Lillie Cassidy	100.35	Joseph Mount	163.62
Harvey R. Curry	48.49	Geo. W. Nivison	139.12
Cathrine W. Schaffer	88.20	Henry A. Olsen	21.00
James H. Gill	73.80	Edward Parson	59.50
Alex. Cassels	154.60	Wm. Thurin	35.00
Katie Baker	57.60	Alfred Van Buskirk	35.00
David A. Little	213.00	Eugene Williams	10.50
Margaret Weier	1.75	Frank Rinschler	24.00
Mary E. Brown	20.00	John McDermott	25.00
Wm. Wallace	60.50	Joseph McDermott	36.00
John Holt	59.81	Frederick Harrison	36.00
Joseph O'Brien	4.50	John Leonard	29.25
Nathan W. Vanhorn	40.00	James Turner	166.50
Henry Pepper	35.00	Patrick Cashin	42.00
Richard J. Willis	35.00	Wm. Cullen	42.50
Robert Baxendale	34.78	George Foye	81.00
Patrick Glancy	33.69	Worthington Gregory	7.00
Michael Farrell	29.75	John H. Keyser	1.75
George Smith	38.81	Wm. Turton	15.00
Alexander Ross	24.56	Chas. W. Shepard	18.75
Michael Kenney	37.88	John Lewis, jr	81.00
John Ruppert	36.56	Stephen Gorey	27.00
Thomas Foster	37.31	Thos. F. Black	29.25
Nathan Whitcraft	18.00	Willis B. Cross	729.00
Alonzo F. Taylor	22.50	John Westerberg	665.50
Samuel H. Yonker	20.25	Patrick Brady	478.80
Franklin Evans	5.44	Wm. Bergen	267.30
Jno. Kelly	6.00	Frank W. Krause	574.00
Samuel B. Bradley	6.00	Michael Hennesey	351.09
L. Richardson	6.00	Patrick Lynch	507.60

employés and the amounts paid to each during the fiscal year 1891 who were d from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid	Names.	Amount paid.
McKenna	$25.90	Wm. H. Bragdon	$996.43
ring	34.36	John Branstrom	23.25
ring	91.19	Carl Branstram	520.63
nio	15.50	H. G. Bransen	12.15
hoe	67.79	D. E. Breniger	680.81
tiker	133.54	John Brennan	78.00
Harlow	600.00	James Brennan	730.00
H. Anthony	290.03	Hugh Bresnehan	23.79
Shepherd	300.00	Cornelius Bresnehan	46.40
Stay	117.00	John Brittain	417.75
Adams	8.44	John Brodie	30.03
on	678.72	C. J. Brown	1,600.00
irs	84.50	A. M. Brown	825.50
lerson	660.25	James Brown	691.87
nderson	317.40	Henry Brown	672.00
lerson	123.53	Charles Brown	58.22
Anderson	13.50	Fred. Brown	10.80
Anderson	6.75	Gust. Bruhus	11.81
Anderson	70.70	Gust. Brusson	6.75
derson	606.86	Paul Bryer	57.21
erson	33.25	Freeman Buel	13.16
derson	24.57	T. G. Buford	984.00
nderson	1.00	William Burke	341.39
nderson	2.50	Pierce Burke	192.00
thony	730.00	P. F. Burke	373.50
nthony	273.93	Oscar Burklin	3.37
hony	40.16	Julius Burmeister	482.87
ple	254.20	William Burns	110.70
Apple	160.11	J. B. Burns	437.27
Archer	224.46	Walter Burgess	13.16
aby	12.71	John Bursell	15.00
p	1.69	Bruno Bush	20.25
Axtman	209.07	Lucien Bussere	18.56
ckman	4.22	D. E. Butler	16.20
aehuk	1,152.25	Ellen Call	80.76
ey	685.69	Jacob Canaga	75.00
ker	32.74	Julius Cardong	8.44
Baker	36.37	George Cardall	294.97
er	18.66	Will Carl	10.50
ks	640.70	John Carlin	1.35
ber	11.47	Patrick Carlin	149.10
Barnes	755.23	C. E. Carlson	22.61
Barnett	686.88	Oscar J. Carlin	11.81
nett	2.02	Charles Carlson	232.87
thel	522.33	Oscar Carlson	319.50
mbach	818.34	Fred. Carlson	160.98
mbach	778.90	Charles A. Carlson	28.69
Baurman	4.22	John Carroll	11.20
Baursfield	94.50	T. P. Carroll	343.79
k	1,250.19	B. G. Carlton	89.10
hart	38.14	Thomas Carney	746.06
ehrens	16.03	J. H. Chandler	672.00
nson	164.35	George Chandler	443.11
nson	26.95	John Channon	1,574.99
Benson	11.62	J. C. Channon	880.68
son	15.00	Albert Christen	334.34
Benock	10.12	George Christensen	651.04
erglof	144.11	Christ. Christensen	739.33
Berg	30.37	N. H. Christensen	10.50
Bemes	12.95	Andrew Christensen	799.76
selin	93.74	Clarence Christensen	104.61
Bester	8.10	James Clancy	461.99
lener	32.06	Robert Clark	1,092.00
gh	203.17	William Clark	115.25
Bliss	164.14	John Claussen	90.61
ss	47.45	W. E. Clevestone	4.05
s	135.42	William Cochran	88.42
ixt	5.91	John Cody	13.50
Boggess	537.35	Michael Coffey	198.12
ohman	71.96	Harry Collins	1,065.38
Boland	18.90	Michael Collins	86.42
llman	131.03	Frank Collins	78.98
Boner	9.28	William Collier	32.90
o	10.12	Dennis Conley	672.00
ornhoft	464.05	Hugh Conwell	63.00
Bottomley	306.00	H. J. Conwell	78.98
Bottomley	146.44	Harry Conwell	153.20
lowers	.67	Martin Connelly	313.03
oynton	126.00	Charles Cook	44.45
ady	614.25	Julius Cook	17.89
adshaw	31.72	William Cooper	17.89

Civilian employés and the amounts paid to each during the fiscal year 1891 who were paid from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
W. E. Copp	$12.00	William Farrell	$139.19
Bernard Corfield	28.35	Henry Farley	10.80
Annie Corken	59.07	Henry Farron	27.34
John Corken	259.89	George E. Fay	447.49
Otto Corken	15.00	August Fedder	5.40
William Cornelius	86.65	Peter Fedderson	15.00
James Cox	2.75	John Feeley	528.97
Michael Coughlin	30.94	John Feldman	88.25
William Coughlin	2.50	Jas. W. Ferris	136.95
Harry Coyne	1.75	W. F. Fidlar	5.00
J. W. Crabtree	12.15	H. D. Fish	672.00
Geo. S. Crampton	31.15	F. T. Fish	634.67
John Cremer	257.12	Sebastian Fitch	21.94
William Creswell	45.50	David Fitzgerald	426.85
J. F. Cromwell	610.51	Margaret Fitzgerald	60.21
Philip Cronin	114.92	A. F. Fleming	1,132.00
Eugene Cross	163.18	H. E. Foster	459.21
Kate Culton	71.81	Chas. W. Foster	60.75
J. M. Cummings	56.00	R. D. Fox	5.40
Stephen Cunningham	111.03	Henry Frahm	20.06
Michael Daly	675.00	William French	19.91
Patrick Daly	41.17	William Freese	10.46
John Dafey	35.27	Henry Frick	177.94
Louis Dainelson	254.81	Frank Friesel	217.81
Frank Darcy	37.87	William Freistat	709.35
Edward Dare	4.00	Charles Francis	1,100.66
Samuel Darrow	8.10	Edward Francis	11.47
Rene Data	3.37	B. A. Fuller	756.25
Harry Daulin	91.00	L. F. Fuller	6.07
John Danlin	91.00	A. J. Fullerton	180.00
Ellen Davis	68.81	Fred Gall	964.06
Joshua Davis	23.45	John Gamble	672.00
Charles Davis	1.75	John Gannon	699.92
John Dede	75.77	John H. Gardner	606.75
Jeremiah Dee	74.92	Thos R. Gardner	153.07
George Deesenroth	2.25	John Garey	9.00
Felix Deloo	20.25	W. F. Garnier	14.85
Adelbert Demarauville	3.54	J. E. Gaspard	222.33
John Depasley	6.75	D. J. Gaspard	138.12
John De Sutler	106.65	Frank H. Geddis	6.00
Peter Dethless	228.63	Honore Gehugte	67.16
John Deutchover	10.80	Fritz Geiger	10.46
Leo Devell	12.15	John W. Gibson	82.39
Martin Devine	2.70	Zee Gibson	4.89
Thomas Devine	2.70	William Gillen	10.12
Emil Dewitt	8.10	Charles Ginnane	136.00
John Dewolff	4.05	John T. Ginnane	457.25
Joel Dewolff	4.05	Jacob Glynn	148.83
Zachariah Dixon	60.20	H. C. Goettsch	478.74
C. P. Dodd	.51	Charles Golden	6.75
W. H. Dodge	506.80	Simon Goldberg	4.00
T. H. Dolly	817.65	W. T. Goodrick	831.07
Edward Dolly	94.25	R. H. Graham	6.80
Michael Doaley	560.35	W. F. Grannis	3.37
Edward Dougherty	124.78	S. P. Grealish	373.12
Edward Doyle	62.30	Thomas Green	904.86
J. H. Drayton	1,899.00	Will Green	91.50
E. J. Drayton	56.48	George Green	4.20
Alvin Drayton	2.25	D. P. Gregg	107.45
Henry Drier	5.00	James Greenwald	265.65
George Duffin	.50	Adolph Grenenger	72.06
Charles Duncan	11.31	Edward Griffith	84.50
Geo. D. Durnin	1,600.00	G. W. Griffith	8.10
Benjamin Eckhart	26.65	W. W. Griffith	106.56
Gust. Edlund	784.95	W. Otto Gronen	1,565.00
W. W. Eggleston	490.00	H. F. Gronen	445.50
Fred. G. Ehlob	287.23	Henry Grosbeck	10.46
Otto Ehlers	152.37	William Grote	463.49
Laurent Eihl	194.00	Leigh Grow	5.74
Robert Ellis	171.45	Daniel Guiney	417.03
Fabian Elmgren	8.10	John P. Guinty	85.72
Bernard Emeik	11.81	C. A. Gustafson	488.80
Joseph Enderle	236.70	Peter Guttarmsen	496.90
V. E. Engdale	14.01	James Hackett	270.67
E. L. Erickson	125.38	Jeremiah Hahn	133.85
Andrew Etzel	248.75	Frank Hakey	6.75
James Evans	105.00	John Hakey	2.02
Evo Even	82.01	George E. Hall	994.47
Olaf Fagalin	189.35	Samuel Hallene	148.84
Louis Fagoel	2.02	William Hammersly	45.50
Anton Fahrner	176.53	J. P. Hammerquist	505.44

n employés and the amounts paid to each during the fiscal year 1891 who were aid from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
Ianilton	$312.02	Harry Johnson	82.50
Iamilton	8.06	C. A. Johnson	37.50
anes	.84	C. F. Jones	42.52
s Hanley	87.85	Emil Jones	16.20
anna	35.77	W. H. Jordan	951.37
Ianser	17.65	John J. Jordan	210.83
Hanson	544.39	Nicholas Jors	6.07
anson	33.92	David Karlbloom	157.27
Ianson	41.24	Fred. Karsch	174.66
Hanson	541.72	Charles Karsow	89.72
anson	19.24	Henry Kasch	41.30
Hart	6.75	John Keefe	977.00
l Hartley	20.93	Theo. Kelly	21.60
Hass	593.19	P. H. Kelly	730.00
n Hassen	7.76	D. W. Kelly	285.47
Haugh	39.37	Martin Kelly	232.57
awley	91.00	George Kelly	355.32
Heden	548.05	John Kennedy	467.24
Heden	23.25	William Kennedy	846.53
leding	9.28	Louis Kennedy	11.40
eenan	539.67	Mary Kent	68.67
Iein	311.86	J. H. Kerr	981.49
Helfrick	15.19	James Kerr	615.25
Hellig	162.33	Henry Kerr	7.26
endricks	21.60	H. L. Kerr	17.81
Henehan	945.74	William Keyser	28.35
Henehan	78.19	Edgar Kindred	91.00
Ierman	457.39	Frank King	91.00
Herman	700.66	Peter King	158.62
Herman	714.58	Martin King	75.00
Herman	61.25	James King	5.40
Hetter	78.29	J. C. Kinney	951.00
Heuer	450.37	William Kinney	9.96
d Heuer	541.31	Patrick Kinney	10.46
Heuer	73.50	J. H. Kirsh	118.99
Hild	3.37	C. B. Knox	666.58
Iill	1,431.55	Frank Knox	32.57
ıy Hill	14.00	Fred. Koops	218.53
Iill	21.53	Alfred Koopler	6.75
Hilton	940.47	Peter Kraft	32.40
Hilton	634.45	D. A. Kreps	13.16
e Hines	93.94	William Kurth	3.37
lodges	765.62	William Laoge	62.10
F. Hodges	128.24	H. W. Laffiin	81.25
W. Hoffmann	455.69	Michael Laflin	1.86
Hoffmann	86.17	W. B. Lancaster	742.22
Hohman	225.61	L. D. Lancaster	303.18
Holm	11.47	D. M. Landis	1,167.68
Holonbek	502.04	Henry Langwerth	404.47
Iolsapple	354.00	Peter Larkin	79.10
s Hoogerwarf	25.31	Jos. A. Lasheck	104.51
Happ	253.31	August Larson	8.10
Horrigan	62.49	Claus Larson	162.66
Howard	244.72	John Larson	11.47
n Hubers	71.95	Lars Larson	29.70
s E. Huntley	118.46	W. J. Lavender	507.50
Iutchings	554.28	J. W. Lawhead	985.47
Hutchings	127.91	Edmund Lawhead	124.22
w Ingraham	75.60	Frank Lawler	525.22
ı Ireland	101.41	Edward Lebart	10.80
saacson	326.37	D. C. Leonard	843.56
w Jacobson	2.70	F. M. Leslie	56.25
Jager	53.90	Robert Lettig	11.44
Jamerson	48.65	J. B. Lettig	446.88
Jenkins	6.00	Andrew Lettig	320.93
Jensen	25.03	John Lettig	68.72
d Jensen	540.31	Irvin Lettig	3.00
Jensen	2.50	E. A. Lewis	743.94
ohnson	833.77	J. H. Lewis	18.56
Johnson	860.75	Charles Lidstrom	188.30
ohnson	67.81	Charles Lind	48.43
Johnson	112.56	Gust. Lind	77.46
E. Johnson	78.97	George Lindsay	38.64
ohnson	73.06	G. L. Littler	672.00
Johnson	355.31	George Loss	10.46
ohnson	502.77	Henry Lorenz	527.63
J. Johnson	25.99	Sophia Lorenzen	20.00
s Johnson	11.47	Emile Lorraine	355.88
G. Johnson	15.19	Frank Lucy	88.83
Johnson	16.54	John Luders	24.13
ohnson	98.63	Nels Lundahl	96.25

Civilian employés and the amounts paid to each during the fiscal year 1891 who were paid from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.
C. P. Lyman	$939.00
William Lynn	19.91
Andrew Lyon	83.25
Marcus W. Lyon	10.50
W. R. Mackay	614.50
J. F. Mackay	441.00
H. R. Mahon	82.50
John Mahoney	419.84
Peter Maleer	27.00
Patrick Malone	287.55
Clarence Mart	15.19
John Martens	672.00
B. K. Martins	81.67
Henry Maskery	538.64
Allen Mason	594.77
John Matzow	46.24
Martin May	336.16
Agnes McAuley	88.96
Luke McCarthy	303.45
James McCarthy	71.89
James McCauley	30.04
Chester McClane	10.80
W. C. McClatchey	14.85
Jas. C. McDonald	634.56
Jos. H. McDonald	53.56
W. A. McDonald	291.18
J. E. McEnery	125.06
Robert McFarlane	1,884.00
W. R. McFarlane	50.27
Edward McGann	256.93
Hugh McGee	306.95
John McGill	2.50
John McGimpsey	51.10
Robert McGimpsey	34.30
M. F. McGrath	672.50
James McGrath	19.24
James McGregor	35.43
Patrick McGuire	223.76
William McKinnell	68.18
Charles McKinstry	36.78
John McMahon	46.25
Edward McNarn	413.10
P. J. McNerney	787.87
Patrick McQuaid	246.53
Michael McWilliams	68.05
Frank S. Melin	44.21
Thomas Merryman	672.00
Christ. Metsch	672.00
Henry Meves	57.20
Steffen Miller	188.32
Louis Miller	171.46
Gottlot Miller	288.74
John Miser	176.87
Robert Mitchell	119.11
Peter Modda	8.61
Charles Modda	24.64
Herbert Modda	2.36
J. C. F. Moeller	401.10
C. H. Moeller	711.24
J. A. Montgomery	672.00
Andrew E. Montgomery	332.00
John Montgomery	558.34
A. E. Montgomery	730.00
R. J. Montgomery	496.60
L. A. Montgomery	71.03
Charles Morgan	31.05
P. F. Morgart	265.59
E. C. Moody	32.70
Mathew Moore	672.00
J. T. Moore	481.26
Edward Moore	179.72
Michael Moore	287.24
M. C. Moore	544.44
Mat. Moore	81.85
Fred. Morris	73.32
August Mortier	8.10
Emil Mortier	1.86
George Mueller	641.55
Thomas Mulcrom	118.50
John Mulcrom	133.14
H. H. Mullen	490.75
John Mulvihill	313.20
D. B. Munro	285.67
R. C. Munson	942.00
John Murphy	603.25
William Murphy	6.00
Michael Murphy	622.25
Michael Murphy, jr	105.70
John J. Murphy	104.10
Thomas Murphy	45.25
Patrick Murphy	91.75
A. F. Murray	784.00
John Murray	562.20
W. W. Nagle	11.20
Fred. Near	6.75
Morten Neilsen	114.00
John J. Nelson	73.20
Bengt. Nelson	20.20
Oscar Nelson	104.25
Eric Nelson	459.20
John Nelson	265.01
Albert Nelson	8.10
Henry Nelson	54.24
Gust Nelson	32.00
Arthur Nelson	1.25
James Nevens	355.00
Geo. W. Newberry	12.00
J. A. Newcomb	4.20
P. M. Newquist	74.75
William Nicholas	21.75
John Nicholas	32.46
Thomas Noden	573.20
W. E. Nogal	653.20
J. E. Nolan	92.25
Anton Norgan	133.74
Ozro Norton	2.25
Theo. North	13.50
William Nuding	10.20
Charles Nutting	1.00
Freeman Nye	19.91
Andrew Nylen	142.75
John Oakes	19.50
Charles Oberg	167.00
John O'Brien	12.46
Robert O'Brien	10.46
Timothy O'Dea	57.00
James O'Hagan	477.20
James O'Heorne	24.64
Charles Ohl	539.40
George O'Keefe	395.14
Axel Oleson	54.84
Charles Olmstedt	7.50
N. J. Olson	513.61
Edward Olson	356.05
Olaf Olson	296.31
John A. Olson	308.05
John Olson	218.19
Nels Olson	173.64
C. A. Olson	179.54
Frank Olson	39.14
John J. Olson	14.66
Charles Orendorff	82.35
R. P. Osborn	123.75
Nels Ostergren	91.00
Phil. Osterling	65.80
Martin Oswald	5.88
Charles Otto	6.75
Henry Owen	17.15
Elias Parke	557.77
Joseph Parker	100.18
David Parker	84.50
J. C. Parker	271.87
R. F. Parker	5.40
Rudolph Passache	19.87
David Payne	10.80
J. W. Peake	850.87
Andrew Pedersen	670.13
Chris. Pedersen	492.24
Edward Pedersen	219.65
William Pender	1.50
George Pemberton	672.00
G. D. Pitcher	934.12

ployés and the amounts paid to each during the fiscal year 1891 who were rom appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
er	$771.22	Gust. Schroder	$149.73
tarson	177.35	John Schuck	246.03
n	113.57	Moritz Schweikert	672.00
rson	141.91	F. H. Sears	92.00
rson	22.95	F. D. Seiberling	593.73
son	644.99	John Seidler	20.62
son	471.97	George Shaffer	494.14
son	6.40	Henry Shall	29.02
fer	212.35	Levi Sharp	11.81
ır	144.00	George Sheldorf	122.34
illippe	126.36	Hiram Shunk	1,428.75
	58.78	George Simpson	785.00
	88.55	John Simpson	11.31
	916.86	R. H. Sitz	405.29
t	557.63	T. M. Smiley	679.34
t	310.40	W. A. Smith	651.99
y	6.75	Charles Smith	6.41
e	192.50	Fred. Smith	59.57
	161.84	Earl Smith	44.49
endt	11.81	Gust. Smith	36.37
h	43.71	Eldred Smith	9.25
ge	85.43	John Snitzer	1,099.00
en	24.47	John Snitzer, jr	79.37
	2.50	Joseph Sohler	63.46
n	49.27	Peter Sommer	65.30
gh	672.00	J. H. Southwell	28.00
	668.75	Edward Splendor	98.71
rg	152.81	E. A. Splendor	98.71
	739.31	James Spenney	70.88
	1,268.05	Henry Sprocklen	10.12
	834.10	Joseph Stanfer	25.31
rdson	6.41	J. R. Stengle	64.89
s	183.93	A. W. Stephenson	931.10
	71.89	Alfred Stephenson	81.74
	42.75	Edwin F. Stephenson	545.15
hton	16.87	Orley Stillman	45.50
	231.87	George Stocker	679.99
	378.74	W. G. Stocker	521.69
	1,383.75	Edwin W. Stocker	39.75
s	1,358.04	Hiram Stocum	282.22
s	14.62	Carl Stolz	306.33
son	36.95	J. H. Story	64.71
ig	557.77	A. B. Stow	905.12
ll	22.95	William Stralendorf	20.25
r	60.24	Henry Struve	11.64
is	14.01	Levine Sturband	8.44
g	58.45	A. M. Sturk	77.62
	71.88	John Sundberg	56.19
	52.50	Charles Surr	12.15
	87.41	Swan Swanson	14.85
ranz	447.72	Andrew Swanson	88.08
al	10.80	Patrick Tague	23.62
ist	13.80	George Thacken	.84
ist	265.43	John Thiel	431.55
	43.33	F. D. Thomas	2.53
	139.04	Oscar Thomas	13.33
	236.90	D. C. Thompson	1,343.24
	154.74	J. R. Thompson	92.80
	658.12	Harry Thompson	100.40
ell	17.16	W. H. Thompson	890.50
	68.72	William Thompson	1.50
	103.95	Martha J. Thornton	66.81
	116.55	Hans Tolfson	114.60
	178.75	Clarence Toliver	185.13
backi	359.34	William Toliver	18.56
	16.20	Joseph Tonery	133.38
	132.63	W. A. P. Totten	1,175.87
erg	7.59	Christain Totten	42.66
s	26.66	Conrad Totten	2.25
ord	16.20	Roy Trego	12.15
m	28.35	Andrew Turby	5.06
	17.55	Allen Tryen	16.20
	302.05	Ira E. Tulloss	233.75
	14.51	John Tyrrell	433.39
ndler	65.81	A. F. Underholt	32.12
	860.93	Henry Utke	31.72
ten	918.29	Peter Van Enanne	157.73
arteleck	82.01	August Verde	1.52
tt	11.81	A. A. Vollmer	24.13
	45.50	George Wahlig	106.92
	120.00	Samuel Walker	18.90

Civilian employés and the amounts paid to each during the fiscal year 1891 paid from appropriations for the Ordnance Department, etc.—Continu

Names.	Amount paid.	Names.
H. M. Walker	888.14	Peter Goeddel
Charles Walstrom	.84	A. Baldwin
Henry Walters	52.10	Louis P. Robert
Fred. Walton	9.06	Terence McLaughlin
Charles A. Washburn	172.20	Alfred Mercer
Jet Weaver	12.15	Henry Maker
W. W. Webster	782.50	M. J. Lee
G. H. Welch	613.74	Jos. N. Kilpatrick
John Welch	148.17	Lewis W. Bryant
Michael Welka	24.46	Jos. Palmier
J. G. Wells	666.52	J. M. Miles
T. U. Wentzel	295.40	William Pills
Russell West	1,600.00	P. J. Crosby
Edward Wood	12.99	M. Frederick
Louis Westphal	835.03	John Lapoint
Perry E. Weyworth	15.19	Geo. A. Chouquette
J. D. Wheelan	303.18	Charles Kendall
Charles Wheeler	45.50	Richard Showock
A. J. Whitney	208.00	A. G. Sinclair
John Whitney	45.50	William Clifford
F. W. Widdington	653.06	F. J. Quinn
Walter Wigglesworth	40.16	Louis Luerssen
W. B. Wiley	98.22	Frank Kahlemeyer
Henry Williams	3.37	William Thom
Daniel Wilkins	435.00	John Glass
Henry Wilkins	13.13	Matthew Farrell
Henry Wilson	8.44	Michael Dowd
Robert Winterbottom	317.78	William Bergen
Henry Wish	3.21	Thomas Bierne
F. M. Woodruff	178.44	Patrick Cody
Jas. W. Wooley	5.57	Patrick Coughlin
Chas. H. Wooley	269.30	Andrew Creighton
Humphrey Wren	69.69	John Erekson
G. A. Wretman	8.10	John Hart
Bruce Wright	3.00	Michael Hennesey
Carl Wulf	4.72	John Sullivan
John Wulfrum	268.87	Philip Wesel
John C. Wunderlick	4.39	Frederick Wilson
Christian Yapp	97.66	Henry V. Murphy
F. D. Yeager	41.35	Thomas McManus
Edward Young	633.73	Peter McTague
Edward J. McElroy	1,400.00	Louis Schereigir
John L. McElroy	1,000.00	William Mebus
W. F. Withers	800.00	Reuben H. Worth
M. J. Keating	918.00	John Egan
F. C. Fredrickson	939.00	James McCoy
John Herberich	780.00	Richard Riley
Ben Fassnidge	418.44	Edward Bannon
S. Seffell	7.50	Erick Hennings
J. Baetz	68.12	George Layman
H. B. Sulliway	5.50	James Somers
E. H. Bacon	14.00	Daniel McCann
Joachim Blesi	5.00	L. T. Farnsworth
J. H. Holmgreen	28.50	Joseph Curtis
Frank Teich	15.75	Charles McDonald
Ed. Braden, jr	1.75	John Ingling
H. F. Vodrie	6.00	James McGinness
L. Allen	6.90	Louis Ettinger
Jess. M. Bell	24.52	Wm. G. Loring
Emil Ripps	630.00	James Spiers
A. Pelleton	647.75	Edwin S. Patterson
J. Ruppersberg	730.00	Henry Mebus
Carl Rietel	728.00	Francis McKenna
G. F. Scharfenberg	730.00	John Thompson
A. Mathews	684.34	Charles Kolarik
Ed. Wood	248.25	August Nolstrom
Gabriel Gray	510.74	George Kastner
Thomas Lally	291.75	Robert Smith
Oscar Fredrickson	419.88	George S. Lappens
C. H. Mueller	2.00	Peter Dunn
William Schuck	30.00	James Mace
F. W. Helssig	30.00	John Ericsson
Voluntine Wilhelm	30.00	John Dowd
John Rauber	17.25	John Abbott
Geo. Kaufman	800.00	Julius O. Hicks
John Duffy	753.00	Joseph Mount
Michael O'Rourke	621.50	Joseph H. Dennis
Fred. Kimmi	11.00	Charles H. Franklin
Bernard Schuette	184.25	Henry Commes
Wm. J. McCormack	14.00	J. J. Alward
F. J. Bleitz	31.50	Barney Creighton

nployés and the amounts paid to each during the fiscal year 1891 who were from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
tins	859.85	M. Donague	851.00
rkins	26.70	J. W. Conley	10.40
ine	21.60	T. Malone	51.00
er	209.88	J. Owens	49.40
wing	286.76	T. Maloney	22.20
	144.00	J. Wallace	51.20
ord	100.85	E. Vaughen	52.00
npson	168.87	T. Rooney	28.00
use	28.10	W. Ellis	25.60
	28.23	T. F. Sullivan	27.00
Somers	25.38	E. McCormick	96.25
pp	143.06	J. F. McCormick	85.44
use	48.55	J. H. Hastings	1,345.52
e	43.97	S. C. Burnham	868.52
y	44.19	C. A. Emery	999.24
Laughlin	43.97	J. S. Adams	963.95
lsh	43.97	D. E. Bragdon	888.03
ilon	43.09	F. R. Bull	1,000.12
ynn	42.00	L. F. Bruce	1,033.83
lly	18.60	C. Briggs	989.21
zer	44.19	S. Bruce	883.50
er	44.62	W. H. Berry	749.77
	44.19	S. Bowers	640.43
ghes	29.75	A. Bourassa	745.51
Jewell	28.00	C. R. Bunker	786.51
Warwick	10.05	J. F. Cranston	853.90
er	2,500.00	P. Connor	810.74
hester	1,650.00	J. Casey	530.02
oll	1,650.00	V. Curtis	888.00
	1,650.00	C. Candrian	965.25
	1,650.00	F. Daggett	798.53
	1,650.00	J. Dolan	596.85
	1,200.00	H. H. Denney	745.33
n	1,000.00	J. Darcy	281.25
an	122.69	C. M. Emmons	840.78
	541.00	E. L. Foss	813.46
	506.00	L. T. Farnsworth	236.84
y	718.03	A. Greenwood	824.66
	617.34	C. H. Hunt	892.52
n	585.20	R. T. Hare	1,025.40
	579.20	M. Hehir	632.25
r	579.80	C. J. Harrington	559.86
rt	576.40	E. Hirst	903.00
ks	585.80	G. Kemater	889.13
y	624.00	J. Keegan	682.04
	498.20	E. A. Littlefield	822.96
	542.28	G. S. Melvin	558.00
	554.09	C. G. Marcy	972.57
er	556.95	J. L. Murphy	786.61
	559.54	C. McCormick	730.00
	551.24	D. J. Manning	869.27
	631.25	A. W. Mackey	721.75
n	497.60	A. C. Newcomb	932.73
	505.20	M. O. Connell	258.20
	445.60	A. G. Perkins	890.65
	534.85	T. H. Perkins	906.00
on	361.60	H. D. Pease	820.20
ton	484.60	E. Pollard	575.40
	492.40	D. Quirk	987.40
n	496.00	C. S. Rogers	890.63
	104.00	E. D. Stock	950.63
	499.60	G. A. Spooner	866.29
	414.40	J. A. Sterling	743.22
hermerhorn	1,092.50	W. M. Watts	832.90
	477.00	T. B. Wilson	933.16
	691.71	J. H. Warner	864.88
	679.93	G. H. Wells	810.58
ld	438.00	A. Wicks	847.90
	1,383.75	M. G. Watrous	866.65
s	819.18	H. Williams	1,062.75
er	773.50	O. Knab	455.88
r	822.31	G. F. Amidon	347.50
y	530.84	E. Brennan	1.75
	821.23	N. E. Brennan	8.00
	848.38	D. J. Quirk	32.40
r	635.63	W. H. Hennessey	8.00
enbach	911.26	W. A. Hennessey	13.20
ay	755.57	N. P. Julian	133.88
	827.76	H. P Denver	10.63
	573.51	R. E. Matthewson	7.00
ck	708.67	M. Scullane	123.38

Civilian employés and the amounts paid to each during the fiscal year 1891 w
paid from appropriations for the Ordnance Department, etc.—Continu

Names.	Amount paid.	Names.
G. Morrill	$123.38	T. Forhan
J. Sayers	83.13	M. A. Fuller
M. O'Brien	88.13	W. Glatthaar
D. Malone	87.50	G. W. Harper
G. E. Smith	.60	J. Hart
J. Stillman	1,336.50	S. Hildreth
D. W. Smith	904.50	B. F. Hobbs
A. P. Adams	820.23	J. Hodgkins
G. Ashley	821.68	F. L. Hosmer
A. Bartlett	829.00	W. E. Hosmer
M. P. Benjamin	837.38	F. L. Howard
J. S. Brown	831.51	A. Hoyle
J. Carlile	792.30	E. Jung
S. W. Chapin	549.46	G. J. Jones
G. M. Coats	833.46	P. Keller
R. M. Cooley	570.80	J. Kirby
R. Danks	801.85	M. C. Kirby
J. Dike	830.97	W. C. Kirby
A. H. Dodge	350.46	S. Lampson
M. O. Fisk	542.40	J. A. Lashorn
E. B. Foster	822.61	J. H. Lombra
D. Gray	60.45	W. Madden
W. Hamilton	825.45	A. D. Massey
J. N. Hemenway	835.64	J. McCowley
W. W. Hemenway	802.55	J. McKelligt
A. E. Jackson	830.15	L. Menz
G. Kendall	780.53	G. A. Miller
W. P. King	819.63	J. N. Moore
A. Lavique	846.42	F. A. Morgan
J. W. Pease	841.64	T. Murray
J. J. Rockwell	819.85	C. Nicholson
R. D. Roper	807.43	E. T. Parsons
L. Sanderson	758.11	F. E. Parsons
B. L. Slocum	819.32	O. N. Perkins
A. Weber	784.63	D. Power
E. C. Wheeler	1,366.32	F. A. Quinby
J. F. O'Neil	1,015.22	J. P. Quirk
J. Alden	899.25	G. W. Rice
J. W. Anderson	848.63	J. Richards
W. H. Daggett	846.02	J. B. Roberts
J. H. Doyle	897.03	H. O. Rockwell
E. Farrar	903.39	P. Schaffer
G. Hosmer	905.26	E. Schneelock
J. A. Turnbull	870.76	W. R. Shipley
G. H. Adams	809.25	C. L. Simons
C. H. Allison	810.97	E. V. Sloan
J. W. Arwin	840.48	C. V. B. Smart
F. Aschenbach	744.16	W. Tegethoff
W. T. Baldwin	822.09	J. P. Thayer
O. B. Bannon	767.15	W. Thompson
D. F. Bardwell	829.23	C. Valentine
E. L. Barthelmes	826.49	A. P. Wade
W. W. Bartlett	818.58	J. M. Weymouth
E. Beber	795.79	W. C. White
T. B. Begley	842.59	J. A. Willey
N. L. Benoit	823.76	J. C. Wood
P. Benoit	832.11	W. S. Wood
L. D. Boyington	825.73	W. M. Cooley
S. H. Broughton	811.26	W. A. Fuller
G. C. Brown	706.22	P. H. M. Brooks
W. B. Burnett	803.70	G. B. Allen
C. F. Carroll	823.80	S. T. Bugbee
O. Chapin	783.31	R. A. Carr
J. F. E. Chamberlain	817.84	L. P Dustin
L. M. Charter	681.56	F. H. Elwell
W. J. Clark	826.74	J. G. Flagg
J. H. Clayton	822.50	A. A. Howard
A. Cline	620.24	S. L. Tuttle
J. W. Collins	386.43	G. I. Weaver
J. Conroy	598.00	J. G. Ahler
J. M. Crighton	813.47	M. A. Aiken
W. Crighton	219.11	H. Alexander
W. H. Crosby	819.54	P. B. Alexander
E. Crowl	844.72	W. C. Amidon
P. Cuff	706.58	E. Barth
T. Donovan	831.35	N. J. Benjamin
C. Drommer	802.31	W. E. Benjamin
J. H. Dunbar	753.71	W. H. Benton
H. Eldridge	745.45	M. H. Boynton
J. Farrell	477.25	W. F. Bradbury
W. L. Fitts	814.40	H. M. Brooks

ıployés and the amounts paid to each during the fiscal year 1891 who were from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
ı	$488.00	L. Streeter	$786.77
	967.87	J. L. Strong	789.94
	803.66	E. M. Tinkham	784.40
)	818.86	J. Tobin	578.80
	724.52	C. H. Tracy	205.82
and	827.27	C. W. Turk	834.62
	549.40	M. Tuttle	816.75
	666.23	S. Van Horn	808.99
	815.30	R. B. Wakefield	439.45
	824.28	H. L. Wansor	8.38
	821.76	J. Wheeler	802.15
	785.68	C. A. White	762.11
ıan	712.67	D. G. White	786.18
	791.23	E. P. White	832.36
	827.15	G. A. White	776.44
ın	841.43	A. Whitney	826.39
	734.92	A. J. Wilder	819.82
ham	682.82	S. G. Williams	832.06
	683.48	A. Witt	792.96
ld	788.77	C. O. Wood	626.06
ng	794.36	E. N. Wood	826.25
ı	747.09	C. E. Bailey	1,848.00
	741.04	W. P. Pulcifer	1,014.00
ır	813.67	L. Newell	965.26
	751.32	R. H. Bailey	804.50
	806.40	M. H. Brown	868.13
	833.59	J. R. Dearborn	902.63
	824.88	L. G. Gilmore	897.75
	715.73	A. Alden	436.00
	815.36	S. Allen	28.88
s	810.98	H. Anschultz	781.17
	800.88	C. B. Arsino	23.75
od	775.56	J. Aumer	817.73
ick	840.19	A. R. Austin	499.20
cock	804.97	E. F. Avery	123.75
	789.73	E. S. Avery	825.70
ıam	823.42	T. B. Bailey	771.06
	803.22	F. N. Bassett	59.60
son	808.10	N. F. Bates	158.64
	795.81	W. Bates	485.32
r	820.68	W. L. Bates	727.03
ll	840.26	G. H. Batty	715.86
n	821.04	F. A. Billings	535.34
	773.25	L. H. Blanden	981.50
t	787.73	E. H. Bly	499.20
	797.31	C. A. Booth	699.60
don	800.65	H. N. Boyden	912.38
rn	715.19	C. M. Boyington	817.45
ence	792.07	G. F. Bowen	979.88
ire	734.97	C. W. Bradbury	760.36
ire	701.54	S. E. Bugbee	715.50
s	803.12	J. K. Burbank	824.72
	731.56	F. W. Cady	818.13
	497.48	P. Carroll	575.42
	832.46	P. Cerrigg	595.00
ey	603.25	H. M. Chamberlin	764.40
	583.20	D. M. Chapman	545.21
	809.42	F. B. Chapman	370.94
ard	761.03	Z. R. Chapman	841.87
	817.52	E. W. Clark	291.56
	814.69	G. F. Clemons	959.97
	657.79	A. P. Cobb	717.01
as	819.94	J. Colton	530.48
	802.95	C. D. Cook	209.00
	817.91	A. M. Cooley	830.83
	2.76	H. B. Cooley	802.93
ll	417.60	F. Cullen	441.40
rds	813.02	G. V. Curtis	499.75
	561.85	W. H. Daniels	847.86
	839.02	R. Darling	911.25
ı	818.63	G. Davis	787.54
l	838.94	W. H. Davis	722.00
rn	834.27	C. A. Dickinson	784.61
ton	765.68	H. Doland	817.84
	845.32	W. H. Doty	623.63
	528.20	M. J. Driscoll	134.50
	816.06	E. S. Dudley	672.06
	843.63	G. During	700.90
s	797.48	E. A. Elliott	819.77
es	803.30	C. H. Fassaur	842.96
as	743.50	W. F. Fennyery	102.49

Civilian employés and the amounts paid to each during the fiscal year 1891 who were paid from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
F. H. Fowler	$429.83	J. E. Shores	$702.18
S. W. Gilman	822.73	J. Slattry	390.00
P. J. Gilmartin	821.63	E. E. Smith	753.00
C. Haggins	464.40	W. A. Smith	779.52
A. J. Hall	827.22	G. S. Snow	828.48
G. B. Hall	804.50	G. H. Sollace	338.16
G. F. Hall	629.45	R. E. Sollace	888.50
L. Harvey	361.40	D. P. Spencer	746.25
F. T. Harwood	192.50	C. R. Stadden	677.75
C. B. Hatch	831.52	S. A. Stephens	788.63
W. E. Hayden	821.02	C. H. Tibbetts	822.76
W. H. Hayden	793.88	M. A. Tinker	832.68
J. E. Haynes	184.06	B. F. Tucker	405.99
C. L. Higgins	829.83	W. P. Tucker	812.57
D. Hitchcock	751.64	J. Wallace	57.75
F. R. Hodge	810.94	E. Wash	585.00
C. H. Hubbard	70.13	R. J. Webster	819.00
F. N. Hunt	82.80	A. A. Whitcomb	17.14
T. Hutchinson	319.60	G. F. Williston	829.57
A. H. Johnson	742.45	J. T. Williston	898.50
A. S. Johnson	173.76	A. B. Wood	695.70
G. W. Kahlhoefer	177.19	T. Wyrwas	409.75
A. Kervick	141.60	G. G. Young	131.25
J. Kervick	595.40	Robert W. Hughes	1,000.00
S. Kervick	77.24	Myron H. Cook	1,095.00
C. T. Kimball	894.69	Andrew Roderer, jr	105.62
O. T. Kimball	116.40	Albert Danielson	48.00
M. King	648.78	Elias Struble	57.00
W. A. King	844.98	Charles Linda	18.00
E. Lachance	287.38	John W. Hulbert	45.00
A. M. Lander	829.15	Jacob Van Blarcum	33.00
M. W. Landers	342.50	Benjamin P. Stickle	44.25
A. Lawrence	814.93	William H. Cooper	44.25
E. R. Lee	815.41	S. P. Stites	45.75
J. F. Lombard	833.60	John Bukey	3.00
C. F. Lovejoy	828.10	John Roderer	63.38
P. Mack	562.49	Philip Blundell, jr	33.00
J. Madden	487.20	Harry A. Carpenter	12.00
P. Malley	569.40	August Danielson	15.30
J. Maher	592.00	Philip Blundell	30.00
P. McDonnell	38.00	Thomas Robinson	105.75
J. McKechnir	1,081.07	Benjamin F. Stickle, jr	34.31
P. McKoe	495.22	John Scales	17.88
P. Meere	610.89	Frank W. McNeal	15.00
J. T. Megette	772.32	William J. Looney	1.65
E. Mercier	847.52	Daniel W. Mathews	51.50
C. H. Miller	685.46	Herman Danielson	5.25
F. B. Miller	839.76	J. J. Vruland	11.56
F. H. Miller	707.15	William Spiser	2.75
J. Miller	648.75	Charles Lisk	60.30
A. J. Moulton	924.75	P. J. Corcoran	7.71
G. B. Newell	329.33	Edward A. Taylor	18.00
W. Linnehan	27.75	George McCracken	41.56
C. O'Brien	382.40	Lewis Pierson	3.40
J. B. O'Brien	27.75	Andrew R. Jennings	141.75
C. O'Connell	802.59	Moses Fichter	460.88
J. J. O'Hare	467.69	David A. Masi	540.00
F. Owens	689.60	Andrew Danielson	273.32
T. D. Paige	783.71	Robert Whithem	474.50
W. H. Paige	813.56	Julius Danielson	150.04
A. L. Parker	831.86	Charles Danielson	26.56
T. H. Parker	68.20	Philip Andrew	16.90
W. J. Parker	772.51	Abram Sickles	92.62
W. L. Parkhurst	225.70	Victor Danielson	70.46
W. G. Patience	579.11	Julius J. Danielson	20.15
A. H. Patterson	813.63	Charles V. Danielson	37.37
G. R. Pease	504.49	William Whithem	72.79
D. T. Perkins	834.92	John Carlsen	12.35
R. S. Perry	247.50	Henry Danielson	75.23
G. E. Phelps	772.48	Patrick Cantwell	7.47
A. H. Pidge	823.93	Richard Hill	3.90
A. Pratt	264.27	August Danielson	2.60
J. A. Reece	811.60	John Morrison	19.50
P. Reynolds	594.32	Edward Dickerson	97.82
J. M. Roberts	590.80	Richard Whithem	12.37
T. H. Rodgers	768.06	Philip Blondell	10.50
E. W. Rollins	812.61	A. W. Chamberlain	3.75
T. Roonay	566.87	William McCormick	3.37
E. E. Russell	659.44	H. A. Carpenter	7.50
J. H. Savage	606.34	Patrick Canfield	10.40
T. W. Shaw	840.96	Albert Danielson	3.00

employés and the amounts paid to each during the fiscal year 1891 who were d from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
nson	$157.95	John W. S. Crossman	$352.22
enport	10.73	Thomas L. Maguire	112.42
lerson	46.31	Edward A. Lawn	55.88
Rowley	401.10	George F. Bumpus	896.10
Hennell	476.63	William W. Ward	577.40
Gregg	1,334.80	Albert E. Nickerson	43.60
Smith	1,400.00	William C. Manion	635.42
olt	806.70	Charles Sanborn	708.50
loward	2,000.00	Charles Ball	1,152.00
Johnson	1,164.00	Orin F. Martyn	758.40
. Brewer	1,565.00	Andrew Pratt	826.58
ier	1,285.90	James W. Winch	896.00
McNutt	840.00	James J. Liddell	673.77
. Cory	1,005.00	Edward McGinty	664.16
. Burke	1,156.00	Daniel McNealey	282.88
V. Bowen	686.40	James F. Nolan	100.70
. Burke	846.36	Henry Mitchell	556.80
. Burke, jr	771.12	Craven Riley	470.64
ve M. Chapman	514.44	Benjamin B. Fenton	192.00
aty	747.32	Thomas D. Reardon	188.48
Cummings	703.68	Stephen Burns	156.40
W. Dadmun	902.88	James F. Cooney	41.44
Drake	72.08	Michael P. Conly	42.92
Elkins	992.04	Carroll D. Dimick	643.00
lfolk	726.08	Lawrence Gaston	417.78
F. Haley	671.84	Patrick Mullen	500.96
ley	755.82	John Powers	158.75
nson	769.42	Daniel E. Brogie	400.68
Johnson	1,198.50	Peter A. Christiansen	168.08
insman	710.72	John Cunningham	293.75
tchfield	1,104.92	James Kendall	406.00
Neal	738.82	John G. Misener	200.02
owell	752.08	Thomas Newman	190.80
S. Russell	762.96	William O'Connor	461.00
. Ryan	48.62	John Reilly	387.42
haw	978.12	James Slane	269.75
er F. St. George	803.16	Clarence Burkick	362.12
. Steward	579.02	Michael Francis	345.75
nson	762.96	Angus B. McIsaac	234.75
venson	777.58	Peter Ploger	338.00
enson	720.96	Patrick Quinlan	38.72
. Tarbox	820.80	Patrick Ryan	52.80
nor	626.28	Daniel Shea	283.36
alsh	807.48	Michael Cashman	101.25
Wentworth	496.74	John Garvey	116.00
an	645.12	Michael Gerrity	132.00
. Costello	490.56	John Marks	124.00
esselgren	580.04	Cornelius McCarthy	6.00
r	560.32	Joseph McCormick	151.20
ire	603.36	Michael O'Connor	123.75
landell	473.28	Thomas P. Parks	71.25
. Johnson	469.12	Thomas Rehill	108.00
. Oberg	124.20	John Condon	5.75
stafsson	353.60	Cornelius Duggan	58.00
oherty	43.86	Thomas Greghen	78.00
arroll	29.58	John Hart	66.00
nnors	29.58	Alexander D. McPherson	77.00
Craig	157.44	Jeremiah Murphy	28.00
. Haviland	181.76	Morris S. Murphy	66.00
pelhman	186.88	William F. Rodd	81.75
cNoah	103.02	Gordon E. Staynor	92.00
Moore	4.08	Holmes Van Buskirk	40.00
ith	15.00	Robert Carmichael	1,148.00
. Burns	469.92	Theodore Mann	759.90
nnelly	506.88	Edward A. McDonough	977.68
onnelly	520.30	John Wilson	912.00
. Fraser	527.78	George K. Sawyer	558.96
y	526.02	John F. McCormick	738.48
. Leonard	506.44	Thomas A. Coffee	507.62
yons	579.25	Hugh Sample	711.76
guire	489.50	Patrick J. Flannery	672.00
son	498.08	William Humphreys	453.60
Sharkey	534.82	Andrew Grealey	455.49
uer	415.75	James Lyons	480.48
. Costello	448.00	William Murray	425.04
aser	327.36	Karl Fletcher	988.40
Hill	263.78	Benjamin A. Blandin	62.40
. McGrath	452.75	Charles S. Worth	903.34
Kenna	102.74	James Connelly	819.06
cLaughlin	455.00	Isaac B. Shute	748.48
e	388.75	Arthur W. Newcomb	296.00

Civilian employés and the amounts paid to each during the fiscal year 1891 who were paid from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
William P. Murphy	$314.24	John Shields	35.20
Clark Smith, jr	130.56	David J. Hines	2.00
John W. Newcomb	542.30	George Thornell	2.00
Neil Dougherty	24.48	James McCue	2.00
Alonzo K. Worth	332.52	Thomas Nippley	2.00
Edward C. Brown	178.50	John J. Sullivan	2.00
John F. Canty	12.80	Patrick Lafferty	2.00
James T. Blaisdell	35.36	James Jerry	2.00
John Madden	13.60	Edward A. Lawn	2.00
William G. Morgan	54.40	Joseph Landry	12.50
Ednell F. Pratt	46.24	Daniel Budrow	13.00
Phillip Raich	42.50	George F. Loughran	60.00
Clark Smith, 2d	51.20	William Buckley	24.00
Henry A. Gildersleeve	601.75	William Burke	6.40
Timothy Murphy	39.68	Martin McCormick	24.00
Gerald Shaw	39.68	John McDonaugh	22.40
Hadley G. Fuller	939.00	Cummings W. Plaisted	13.00
Patrick Kelleher	876.40	Michael Tierney	8.00
Lawrence Mahearn	440.00	Geo. H. Wright	66.00
Patrick Nally	491.72	James Karius	7.20
Frank Stanley	121.44	Joseph Flannigan	7.20
William A. Carroll	226.60	George S. Bowen	322.10
Frank U. Witmore	315.25	Edward F. Mulhearn	17.30
John B. Mack	3.75	William E. Woodbridge	1,548.00
Levi Brundage	169.62	Hugh O'Connor	532.20
Patrick Gallagher	95.76	David A. Meister	122.24
Daniel J. Kelly	389.04	Humphrey Glaze	249.12
John O'Brien	306.92	John Reardon	145.92
Anthony Connally	15.84	Lawrence Bradley	76.80
Catherine Forrest	2.00	Myles Dempsey	432.00
Jane Hauck	5.88	James Ramsey	12.00
Thomas Ford	217.84	John W. Cunningham	151.75
Michael McDonagh	138.24	Edward J. Hurrell	66.00
Amos W. Merserve	88.02	John J. Sheehan	64.00
William Mongan	290.84	Frank Connors	40.00
Keiran Murphy	1.44	James Mulhearn	40.00
Patrick Sealy	288.68	Rufus W. Gifford	229.37
James Gallagher	7.20	Daniel E. Allen	170.15
William O'Hearn	48.60	William F. Brown	190.21
May J. Forrest	2.73	James E. Callahan	196.40
Emma Mack	1.50	Thomas McCarthy	30.00
John Gill	153.76	Geo. W. Craig	73.12
Caleb Wheaton	75.04	Edward Croch	24.00
Dennis Colahan	17.60	Patrick Grace, jr	24.00
James H. Coburn	61.20	Joseph W. Lyons	24.00
John Condon	65.00	John Breslin	30.50
Robert Connor	94.40	Jeremiah Clifford	26.50
Jerry Costlo	44.40	James J. Connors	34.50
Patrick Cunniff	25.60	Joseph Duggan	30.00
Patrick Curly	110.40	Daniel B. Fitzgerald	65.50
William Finerty	86.00	Wm. H. Fuller	35.50
John Fitz Gibbons	4.80	Hugh Gallagher	30.50
Francis Garvin	67.20	Edward Haurahan	30.50
William Garvin	13.80	Hezekiah Howe	26.00
Michael Smith	8.20	Henry McDonald	65.50
William Henry	41.60	James McDonald	65.50
Edward Kennington	16.20	John McDonald	65.50
Jeremiah J. Kiley	99.60	James Rodgers	34.50
John Marchant	14.40	Joseph Ryan	30.00
James McLain	12.80	William Storey	33.50
Patrick Moran	94.20	Stephen Tibbetts	26.00
Daniel Mullen	8.80	George Walker	19.50
Thomas Murphy	94.20	James Brennan	28.50
John O'Brien, 2d	27.90	Oney Cunningham	28.00
Timothy J. Quinlan	55.20	James Gleeson	22.00
John Reardon	9.40	Martin Gleeson	22.00
Mathew Ryan	16.20	John H. Smith	28.00
Owen S. Kahill	43.80	Thomas Teowan	29.88
Timothy Stuart	66.00	Patrick Welch	78.00
Ralph B. Taylor	97.00	Patrick Walsh	30.00
Patrick Vahey	93.80	Michael Connors	40.62
Michael Walsh	41.40	Dennis McGrath	43.12
John Welch	16.80	John Powers	497.92
John Welch, 2d	8.80	Patrick Cummings	71.68
Michael Welch	12.80	Axel D. Tobin	2.56
Henry Williams	19.20	John H. Barnacle	74.24
Thomas Williams, jr	23.60	Patrick Flaherty	52.00
Thomas Williams	1.60	Michael Tierney	40.00
Thomas Greeley	4.00	John Burke	12.00
John Hogan	4.40	John Ryan	13.00
Joseph O'Neal	4.00	John Tierney	8.00

employés and the amounts paid to each during the fiscal year 1891 who were d from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
. jr	$8.00	Joseph Connors	$493.40
woney	8.00	John Burke	94.30
anen	10.00	William Murphy	161.11
lodding	7.87	Patrick H. Carroll	621.20
. Kelley	10.80	Robert Williams	946.44
ewcomb	3.50	W. M. Edmans	868.06
Murden	5.55	Joseph Dufresne	781.83
Childs	43.60	Hugo Gackstatter	663.88
Hooper	43.60	John Heinzenberg	710.78
. Maguire	167.21	David Gray	678.86
Lagan	140.62	Edward Hopkins	614.60
cClosky	20.62	J. B. Seney	702.10
Spinner	97.62	Clinton Stewart	719.18
Maguire	4.81	Christian Helser	575.66
Ileason	33.68	Patrick O'Brien	448.28
Lawson	33.68	David Cook	110.04
rahan	49.28	James Hargraves	426.30
acey	109.12	George Nichols	44.80
urphy	118.00	John Moore	54.60
owers	128.00	Michael Frset	31.36
uinlan	114.[illegible]	Ernst Helser	579.32
. King	20.00	Adelbert Kuenstle	298.90
H. Bustin	21.00	Michael Finigan	308.70
. Robinson	50.00	Isaac Lafayett	44.38
te	55.00	John Rousseau	283.22
Valters	1,600.00	John McCann	299.46
ook	1,200.00	John O'Hair	159.60
. Roth	1,200.00	Thomas Clifford	101.64
tto, jr	1,200.00	Anthony Murray	101.64
Laughlin	830.00	A. B. Knowlson	15.35
Victorin	3,000.00	Richard Hopkins	9.50
. Bowditch	240.40	William Dornig	679.70
rath	161.40	Conrad Coon	200.20
nertz	193.21	George Falkner	39.20
ss	877.80	Charles A. Benjamin	38.08
ner	99.00	Thomas Lowe	79.24
ert	1,060.00	Patrick Bragin	257.80
ton	563.50	John C. Smith	375.00
Hill	1,243.81	David Perry	318.80
Voelk	945.72	John Barrett	132.40
iney	1,033.40	Philip Dufy	156.20
omas	26.68	Beverly R. Burnish	46.00
kins	131.32	William H. Barnes	109.60
ristiansen	2,119.80	Alex. Chapman, jr	130.90
ris	1,284.00	John Murphy	126.20
Baynes	1,328.00	Michael J. Flannery	87.30
Johnson	1,259.50	Dennis Hennessy	726.00
ook	1,291.50	Thomas J. Furlong	114.00
ns	1,343.75	Charles Furlong	691.12
r Hinchliffe	1,202.50	Patrick Finn	427.62
Gerdom	1,260.70	Thomas Coates	430.73
ick	1,151.30	James Christie	25.00
Phelan	777.97	J. J. Reilly	789.05
nglish	756.88	Michael F. Hogan	220.88
L. Kelly	855.41	George P. Plunkett	957.35
adigan	764.38	George Horrocks	647.27
lark	858.62	Philip H. Hayner	704.98
Cox	721.12	Edward Kerr	649.48
nan	757.64	William Jones	239.14
lmstead	770.19	Richard Boyle	414.05
Wolfram	738.57	Joseph P. Mitchell	393.69
Larkin	783.37	Andrew Berr	90.77
Morris	781.49	James Dwyer	125.79
Jewell	33.62	Sidney H. Babcock	521.76
ooney	572.68	Robert Brant	113.10
very	463.27	John H. Towner	290.67
ney	441.91	Samuel Wallace	81.50
Keating	396.91	Darwin Vanarnum	582.75
hattock	446.98	James Ward	560.49
Douglass	464.22	William J. Burke	583.25
Farrell	441.10	Peter J. Cook	76.00
Storen	477.25	David Kane	407.86
Morris	108.93	John Purtel	166.99
Meachem	113.99	William Burke	492.60
ver	114.18	Daniel Conway	433.56
oran	100.96	James Clark, No. 1	487.44
ney	90.93	Charles Meachem	443.31
Curtin	66.63	Patrick Doyle	398.69
Hill	3.00	William McCabe	509.49
patrick	323.95	John Lowary	143.52
. Lucas	322.37	Edward Manogue, No. 2	109.21

Civilian employés and the amounts paid to each during the fiscal year 1891 who were paid from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
Stephen Dunn	$260.88	Simon Mullins	$167.56
John Duffy	81.74	W. T. McAuliffe	111.91
John Dyer	327.36	Charles S. Heurich	93.24
Arthur Kuhl	25.78	Edward M. Morse	1,091.16
Charles E. Trowbridge	12.75	S. E. Selleck	1,129.03
Edward Tyrrell	482.80	Marvin T. Merchant	1,288.45
Martin Haigney	509.43	A. J. Hill	551.75
Charles W. Buswell	469.45	Robert Taylor	885.33
William Gregory	493.84	John Fred. Wallenstrom	885.35
Charles Potter	481.88	F. L. Roberts	885.33
Martin J. Mullins	361.84	George F. Butler	885.33
John Stagerwalt	472.74	Charles H. Van Leuven	623.31
John Bainbridge	97.87	C. H. Mattice	350.45
Arthur Hargraves	367.90	G. Willard Morey	885.03
Richard Markey	8.43	Thomas Crowe	988.33
Frederick Bisig	354.03	Prentice Rodgers	420.05
John Gallagher	428.14	James Reid	417.09
Matthias Vanderzee	262.10	E. Ellsworth Craig	289.45
Patrick Noonan	79.87	John Dorney	284.34
John O'Sullivan	3.18	William McCune	265.03
Andrew Guy	427.45	Charles W. Jones	867.33
Frederick Turner	527.01	Grant Holt	371.34
Simon A. Lappens	553.11	Robert Cockburn	199.33
Anton Sulzberger	573.11	William Cockburn	199.76
James Whelan	432.33	Charles Quillinan	612.15
Christian Larsen	499.16	George Latnay	993.03
Patrick Mooney	530.84	Emil Page	619.14
Thomas Hagney	475.25	Thomas S. Cooper	406.97
Philipp Strohecker	554.66	Lawrence Boland	17.05
Patrick Fitz Gerald	522.03	John Williams	19.03
Christian Olsen	484.08	William McNab	787.49
William Hewlett	470.76	William Robertson	817.45
William Cary	345.33	Olaf Christiansen	873.22
John Culliton	281.02	William Tucker	332.28
Patrick O'Connell	351.81	John A. Buckbee	542.80
Robert McCabe	384.78	Frank Leonard	433.20
Edward Sherlock	189.45	John Scott	391.06
Charles Vandenburgh	10.21	Thomas Bainbridge	364.40
John J. Connell	153.17	W. B. Seigle	339.96
Michael Guy	127.20	George Weber	259.16
Martin O'Hair	41.06	Harry Devoe	289.85
John Burke, No. 2	404.12	John A. Spring	235.60
James H. Cain	195.84	Thomas L. Blackburn	231.25
Elias White	12.00	Edward J. Babcock	513.51
John E. Smith	12.80	Patrick A. Larkin	716.02
Lawrence Brennan	18.00	H. H. Connor	339.05
John Miller	35.81	James Real	754.39
Lewis Walters	16.50	Charles Harrod	354.02
Gregory Gerdom, jr	435.90	Charles Palmer	172.05
Frank Radigan	363.53	Thomas McDonald	93.00
Charles Ruede	839.12	Leander Anderson	302.73
Charles E. Soderstrom	884.16	William Morris	60.14
John J. Larkin	805.61	Pierson Koon	694.95
Andrew H. Gerdom	783.39	George Wright	43.71
George V. Congdon	752.14	N. J. Howley	4.96
Abram King	741.18	Charles N. Smith	4.34
Edward Jenkins	581.18	William J. Tucker	295.32
Michael Sullivan	758.48	Michael E. McMahon	643.05
John A. Fearey	606.51	Frank Morrison	348.02
William A. Wilder	706.95	E. M. Rogers	356.05
Hugh Wier	697.18	James Pipe	334.05
Peter Mac Ewen	721.44	Michael O'Shea	243.74
William J. Palmer	705.65	Otto R. Madsen	226.68
William T. Derrell	688.38	Peter Murphy	91.56
John Diggery	681.80	Charles Emons	178.40
Daniel Gehm	594.16	Charles Mix	34.72
Frederick W. Abbott	428.82	John E. Bassett	34.72
Joseph F. Alber	169.12	Samuel Andrews	19.86
J. E. Alexander	116.48	Patrick Moran	5.04
George M. Gallagher	418.74	John F. Hassett	134.69
William Gurley	5.00	E. H. Ford	2.52
James H. Gilmora	586.04	Edward McNamara	7.84
H. S. Darby	62.53	Albert P. Olmstead	479.01
E. A. Wager	61.38	C. H. Soule	283.05
E. B. Toedt	1.75	John E. Gage	22.47
Joseph C. T. Dutcher	909.20	Henry H. Brown	552.05
Thomas A. Keating	601.82	Arthur N. Cross	91.28
John V. Burt	548.78	Samuel McRoberts	1,257.56
Oscar Soderstrong	711.35	Samuel F. McRoberts	830.87
Fred. Miller	667.08	James Cavanagh	17.05
William P. Maher	755.10	James W. Clarke	37.24

employés and the amounts paid to each during the fiscal year 1891 who were d from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
erry	$116.56	Thomas P. Heenan	$33.74
guson	140.22	Samuel Barnett	38.12
es	193.80	Elfriede Wager	15.23
caid	65.41	William H. Flewwellin	890.73
inney	85.79	Edward Warner	378.24
ahey	203.83	Hugh Mullen	118.77
racey	599.53	William Crall	161.07
Becker	47.43	Charles S. Holman	135.76
L. Colbert	125.30	Milton Ditmire	116.71
toliker	7.70	Frank Ditmyer	117.46
reen	98.11	Hiram Austin	117.36
rgay	46.76	Patrick O'Connor	113.42
ion	61.53	John Danaher	118.42
. Clifford	68.15	James Thompson	146.24
Cutler	68.15	Denis Mahoney	285.91
Connett	68.15	James Kelly	306.90
rquhardt	41.72	James H. Quilkin	131.79
rrland	7.98	Frank Mulryan	105.64
fley	44.38	Edward Crall	119.89
lan	229.09	William Dunigan	78.73
mond	10.50	Thomas Welsh	139.77
lville, jr	31.08	Daniel Howard	11.25
e	38.36	John Kelly	12.00
tterson	407.57	Charles Morrison	12.18
re	412.25	John Stenman	9.37
Vild	24.64	Henry Evertsen	128.08
Krause	163.94	Samuel Moore	38.24
Neemes	59.36	August Battige	158.70
eemes	59.36	Maurice Daly	245.88
Bailey	59.36	E. C. Green	511.39
y	13.02	Elmer W. Hinchliffe	463.95
cKechine	63.98	William G. Brower	465.37
ehan	19.04	John Hogan	124.02
lam Widstrand	19.74	Patrick Owens, No. 2	106.23
oe	15.40	Joseph Haigney	79.87
nson	44.38	Albert Hutchinson	86.24
	13.30	William Daly	14.81
rling	8.96	John Leonard	36.74
burnham	17.15	Patrick Duffy	15.74
ess	73.64	Charles Schweikart	48.74
radly	31.36	James Dwyer	32.80
opfl	322.08	John McKee	21.18
Mason	29.96	James Bitely	16.50
num	11.62	Isaac Gilbert	16.50
berle	188.71	George McOmber	13.87
langan	20.16	James McMahon	66.74
affrey	11.06	George Zukoski	66.74
cNamara	39.34	Joseph A. Walsh	88.30
anker	79.31	Joseph Goodyear	108.16
nters	31.22	James Clark, No. 2	36.46
ee	151.26	Augustus Clark	8.25
erdahl	162.18	Archie Crawford	50.24
Beth	154.38	George Niebuhr	364.69
da	8.37	James Dolan	1.31
	14.00	Patrick Pinders	1.31
cDonnell	12.65	John Bennett	8.35
Martin	714.18	John Moran	6.60
Ford	650.37	Philip Kirchmeier	229.77
Reardon	495.65	Robert Burns	57.18
nt	133.54	George Hines	167.70
n	38.15	William Lynch	64.58
	12.69	Thomas Danaher	130.76
Pateman	231.24	Richard Sherlock	140.98
olman	877.20	William Kirchmeier	213.60
Dotson	14.00	Jacob Gunson	186.55
anogue, No. 1	10.70	Joseph Blackburn	3.65
l	258.90	George Duran	21.00
Dollar	735.05	Thomas O'Leary	43.77
Cline	29.12	John F. Drake	4.87
Burns	16.24	Michael Messitt	6.00
rshall	26.74	Clem Dwyer	6.75
ling	25.90	John Orth	6.75
ffin	33.74	Henry L. Jewell, jr	44.62
Griffin	30.24	John Dorna	39.93
Yearsley	33.90	Michael Burke	13.87
Carroll	37.24	John McLaughlin	26.81
ehan	19.79	Sidney S. Smith	13.50
Browne	19.74	John Reardon	13.87
dwards	15.75	Thomas Boyle	20.81
ower	15.75	Bushrod Millspaugh	22.31
oll	25.48	William T. Wilson	23.66

Civilian employés and the amounts paid to each during the fiscal year 1891 who were paid from appropriations for the Ordnance Department, etc.—Continued.

Names.	Amount paid.	Names.	Amount paid.
William Wilson	$24.56	John W. Van Vorst	$322.08
James McAleese	29.81	John Foley	317.05
William Barry	28.87	Pierce F. Burke	76.12
Charles Coglin	31.68	Charles Austin	624.00
Patrick Owens, No. 3	22.31	Simon J. Mullins	552.00
Thomas Johnson	31.68	Hugh G. Neary	197.40
Patrick Dormody	31.12	Patrick Owens, No. 1	773.96
Edward Reardon	30.37	Peter J. Corbett	468.90
Thomas Muir	16.50	James Sterns	741.90
Stover M. Johnson	540.44	John J. Daly	748.87
Culver H. Ten Broeck	454.54	Patrick Keough	658.45
Elmer Swatling	124.68		

Report of names of civilian employés of the Medical Department of the Army "and amount paid to each during the fiscal year 1891," as required by act of Congress approved February 24, 1891.

Names.	Where employed.	Time employed.		Amount paid.
		From—	To—	
F. W. Teulon	New York, N. Y	July 1, 1890	June 30, 1891	$1,800.00
J. H. Howe	ditto	ditto	ditto	1,600.00
John Thompson	ditto	ditto	ditto	1,400.00
Edmund Hanley	ditto	ditto	Dec. 31, 1890	600.00
Paul E. Vollum	ditto	Jan. 1, 1891	June 30, 1891	600.00
Jos. A. Levick	ditto	July 1, 1890	ditto	1,000.00
Chas. W. Swallow	ditto	May 12, 1891	ditto	84.93
W. H. Metzger	ditto	July 1, 1890	ditto	720.00
Charles Fischer	ditto	ditto	ditto	1,007.35
Henry O'Neill	ditto	ditto	ditto	834.00
F. J. Teulon	ditto	ditto	ditto	722.35
George Farr	ditto	ditto	ditto	713.35
George R. Watson	ditto	May 12 1891	June 30, 1891	72.50
Jas. H. Reid	Governors Island, N. Y. H	July 1, 1890	ditto	1,800.00
P. R. Wagner	St. Louis, Mo	ditto	ditto	1,800.00
Robt. H. Enyart	ditto	ditto	ditto	1,600.00
R. C. Sprague	ditto	ditto	ditto	1,600.00
Wm. Throckmorton	ditto	ditto	ditto	1,400.00
Patrick Dooley	ditto	ditto	ditto	900.00
Nicholas Wall	ditto	ditto	ditto	780.00
Patrick Foley	ditto	ditto	ditto	840.00
John Utchen	ditto	ditto	ditto	840.00
John Henry	ditto	ditto	ditto	720.00
Frank Ghio	ditto	ditto	ditto	720.00
William Lennon	ditto	ditto	ditto	718.00
R. H. Walker	ditto	ditto	ditto	720.00
Ewald Prinz	San Francisco, Cal	ditto	ditto	1,800.00
James Doran	ditto	ditto	ditto	1,600.00
Thomas Delaney	ditto	ditto	ditto	1,200.00
John J. Carroll	ditto	ditto	ditto	1,022.00
N. Duckel	ditto	ditto	ditto	360.00
G. W. Smith	ditto	ditto	ditto	240.00
Frederick Harris	ditto	ditto	ditto	600.00
Geo. W. Russell	Los Angeles, Cal	ditto	ditto	600.00
Chas. O. McDonald	St. Louis, Mo	ditto	ditto	600.00
Frank Foster	St. Paul, Minn	ditto	Nov. 13, 1890	245.34
John C. Aune	ditto	Nov. 14, 1890	Apr. 15, 1891	253.33
John Zedler	ditto	Apr. 16, 1891	June 30, 1891	125.00
Washington Crusor	Washington, D. C	July 1, 1890	ditto	1,200.00
F. W. Bassett	Hot Springs, Ark., Army and Navy General Hospital.	ditto	ditto	1,400.00
Edwin Collins	ditto	ditto	ditto	720.00
Henry White	ditto	ditto	ditto	480.00
Pete Musgrove	ditto	ditto	ditto	480.00
Thomas Jenkins	ditto	ditto	ditto	360.00
Wm. H. Joyce	ditto	ditto	ditto	600.00
Burl Daily	ditto	ditto	July 31, 1890	40.00
James Burke	ditto	ditto	Aug. 31, 1890	50.00
Lewis Taylor	ditto	ditto	July 31, 1890	20.00
Thomas W. Hensal	ditto	ditto	Mar. 31, 1891	270.00
Isom Adkins	ditto	ditto	June 30, 1891	360.00
A. A. Baumstark	ditto	ditto	ditto	330.00
James Martin	ditto	Aug. 1, 1890	ditto	440.00
David Cunningham	ditto	ditto	ditto	330.00
J. M. Cox	ditto	Sept. 1, 1890	Sept. 30, 1890	30.00
Joseph White	ditto	Oct. 5, 1890	June 30, 1891	354.06

Report of names of civilian employés of the Medical Department, etc.—Continued.

Names.	Where employed.	Time employed.		Amount paid.
		From—	To—	
ames Johnson	Hot Springs, Ark., Army and Navy General Hospital.	Oct. 1, 1890	Oct. 31, 1890	$20.00
ime Rivers	do	do	do	30.00
hn Collins	do	Nov. 8, 1890 Apr. 1, 1891	Nov. 30, 1890 May 31, 1891	75.00
lijah Kaufman	do	Nov. 1, 1890	June 30, 1891	160.00
rank J. Adelman	do	Dec. 1, 1890	Dec. 23, 1890	15.00
aniel Ross	do	Jan. 1, 1891	Mar. 31, 1891	60.00
illiam A. Swigart	do	do	June 30, 1891	180.00
seph Terrill	do	Apr. 1, 1891	May 31, 1891	40.00
hn Foster	do	June 1, 1891	June 23, 1891	15.00
rs. Theresia Swigart	do	July 1, 1890	June 30, 1891	180.00
rs. Maggie Dalton	do	do	do	180.00
rs. Addie Barry	do	do	Oct. 31, 1890	60.00
rs. Weshina White	do	Nov. 1, 1890	June 30, 1890	120.00
Total	do			42,837.81

WAR DEPARTMENT,
Surgeon-General's Office, December 12, 1891.

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tatement of the names of civilians employed in the Subsistence Department, U. S. Army, during the fiscal year ended June 30, 1891, where employed, and the amount paid to each during the same period.

Names.	Where employed.	Amount received.
ilman Adams	Baltimore, Md	$4.88
ames Allen	Chicago, Ill	1,461.13
athan L. Angus	Omaha, Nebr	339.00
lexander Atkinson	do	1,165.00
eorge Bell	New York, N. Y	750.00
ugh Bell	do	1,800.00
m. M. Bingham	Chicago, Ill	125.00
. C. Bonsal, jr	do	1,800.00
ames Bowers	Omaha, Nebr	84.17
loward W. Brown	San Francisco, Cal	1,573.32
lexander Brown	Baltimore, Md	94.00
rank Bryan	Governors Island, N. Y. H	1,600.00
atrick Buckley	Fort Leavenworth, Kans	420.00
m. J. Buehler	Pine Ridge Agency, S. Dak	241.67
ohn J. Buffington	Baltimore, Md	247.50
ames Bulger	Governors Island, N. Y. H	340.00
. H. Burles	St. Louis, Mo	600.00
enry Bus	do	900.00
ohn Cannon	do	1,500.00
scar Caton	New York, N. Y	1,012.00
dward M. Clitz	do	952.00
urns Connelly	Washington, D. C	540.00
ayette Cook	San Francisco, Cal	740.00
a Cook	do	1,046.64
. C. Denney	Fort Leavenworth, Kans	675.00
. Dillon	Omaha, Nebr	1.00
eo. S. Doane	Vancouver Barracks, Wash., and Baltimore, Md	1,217.50
. R. Duff	San Francisco, Cal	1,573.32
ames B. Duffy	Frankford Arsenal, Pa	106.05
. G. Elderkin	Los Angeles, Cal	375.00
. H. Eldridge	Portland, Oregon	1,800.00
oseph Farrell	Fort Leavenworth, Kans	855.00
am'l A. Fiske	Governors Island, N. Y. H	1,160.00
ichael Fitzgerald	Washington, D. C	93.00
. C. Franzoni	do	1,080.00
am. Gardiner	Fort Leavenworth, Kans	330.00
ohn Gately	Washington, D. C	720.00
oseph Germann	St. Paul, Minn	1,000.00
eo. F. Gordon	New York, N. Y	1,560.00
m. H. Gordon	Baltimore, Md	1.50
. H. Govett	San Antonio, Tex	225.00
rnst G. Grube	Omaha, Nebr., and New Orleans, La	1,325.00
m. Guenther	St. Louis, Mo	1,200.00
has. Habney, jr	New Orleans, La	660.00
mmet Hamilton	St. Paul, Minn	1,624.00

Statement of the names of civilians employed in the Subsistence Department, U S. Army, during the fiscal year ended June 30, 1891, etc.—Continued.

Names.	Where employed.	Amount received.
Richard M. Hanson	Washington, D. C	$1,200.00
Emma S. Hay	Denver, Colo	183.33
Jack Hing	New Orleans, La	540.00
Wm. Holt	San Antonio, Tex	1,800.00
J. W. Hooff	Washington, D. C	1,680.00
John Hooper	Baltimore, Md	125.00
Otto Hoppe	San Francisco, Cal	740.00
Alonzo Houck	Washington, D. C	1,500.00
M. W. Houck	New York, N. Y	962.00
John Hughes	Baltimore, Md	115.00
F. H. Hunecke	Washington, D. C	1,120.00
P. J. Hunecke	do	795.00
Lee Ijams	Portland, Oregon	32.50
Frederick T. Johnson	San Francisco, Cal	1,493.32
Wm. F. Johnson	Omaha, Nebr	135.00
Frederick Johnston	Chicago, Ill	1,800.00
John Kellogg	do	480.00
John Kelly	do	625.83
Frank Kesler	Omaha, Nebr	540.00
Frank Kinerney	Fort Leavenworth, Kans	810.00
James Kinerney	do	270.00
Geo. Kraverath	New York, N. Y	2.00
James Larney	Vancouver Barracks, Wash	100.00
J. Laverty	New York, N. Y	4.00
James Little	Fort Leavenworth, Kans	420.00
Henry Loshe	New Orleans, La	1,500.00
Geo. Lough	San Antonio, Tex	299.50
E. M. Mathson	Los Angeles, Cal	150.00
Jos. S. Mattingly	Washington, D. C	540.00
Chas. May	Fort Leavenworth, Kans	15.00
Frank B. May	Chicago, Ill	1,420.67
V. H. McCormick	New York, N. Y	1,260.00
John McCue	Washington, D. C	540.00
Edmund McGrath	Chicago, Ill	50.00
Edmund J. McGrath	do	725.00
James McGuire	San Antonio, Tex	1,320.00
Ernest W. Moore	Los Angeles, Cal	1,125.00
Edward Morris	Baltimore, Md	3.75
Patrick Murray	Denver, Colo	600.00
Geo. G. Meyers	Baltimore, Md	1,800.00
C. K. Nash	Vancouver Barracks, Wash	690.00
Henry R. Newcomb	Omaha, Nebr	40.00
J. A. C. O'Neill	St. Paul, Minn	640.00
Wm D. Osgood	Omaha, Nebr	500.00
John Pickard	Chicago, Ill	548.66
Chester M. Pratt	do	1,454.88
Chu Quong	Los Angeles, Cal	250.00
Michael Reardon	Chicago, Ill	625.83
Geo. C. Reed	San Francisco, Cal	262.50
Chas. H. Richards	Portland, Oregon	243.33
Guy C. Richards	do	23.34
Herman J. Rick	Denver, Colo	1,600.00
John Ridd	San Antonio, Tex	780.00
E. M. Rowley	Vancouver Barracks, Wash	1,200.00
Andrew G. Ryer	San Francisco, Cal	900.00
J. W. Ryland	Los Angeles, Cal	1,800.00
John Salter	San Antonio, Tex	540.00
H. C. Scott	New Orleans, La	375.00
H. O. Shaughnessy	Vancouver Barracks, Wash	320.00
John Sheehan	Los Angeles, Cal	176.66
A. P. Slingerland	New York, N. Y	738.00
Robt. D. Smith	Chicago, Ill	300.00
J. R. Stafford	Omaha, Nebr	216.00
Herman Steger	Frankford Arsenal, Pa	21.70
Frederick Stevens	Chicago, Ill	1,378.66
Robt. J. Stevens	do	161.33
D. St. Geyer	Omaha, Nebr	1,725.00
Charles Sullivan	Boston, Mass	900.00
James Sullivan	St. Paul, Minn	1,800.00
Samuel M. Sullivan	Boston, Mass	1,200.00
E. D. Thomas	do	1,800.00
M. C. Travers	Pine Ridge, S. Dak., and Omaha, Nebr	709.17
Wm. E. Tuck	New York, N. Y	750.00
Thomas Tully	San Francisco, Cal	1,800.00
T. C. Turlay	Fort Leavenworth, Kans	300.00
Robert Wallace	San Antonio, Tex	24.00
J. E. Waters	Omaha, Nebr	1,125.00
A. Wernher	Fort Leavenworth, Kans	1,800.00
Emory A. Wheeler	St. Louis, Mo	1,800.00
James L. White	New York, N. Y	814.00
George Winter	Omaha, Nebr	450.00

52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc. No. 20.

SABINE RIVER, TEXAS.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING,

With a letter from the Chief of Engineers, report of the examination of the Sabine River, Texas.

JANUARY 5, 1892.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 8, 1891.

SIR: I have the honor to inclose herewith a letter from the Chief of Engineers, dated November 20, 1891, together with a copy of a report from Maj. James B. Quinn, Corps of Engineers, dated September 3, 1891, of a preliminary examination and survey of "Sabine River, Texas, from where said river empties in Sabine Lake to Sudduths Bluff, on said Sabine River," made by him in compliance with the provisions of the river and harbor act of September 19, 1890.

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., November 20, 1891.

SIR: I have the honor to submit herewith a copy of report, dated September 3, 1891, on preliminary examination of "Sabine River, Texas, from where said river empties in Sabine Lake to Sudduths Bluff, on said Sabine River," made by Maj. James B. Quinn, Corps of Engineers, in compliance with provisions of river and harbor act approved September 19, 1890.

It is the opinion of Major Quinn and of the division engineer, Col. C. B. Comstock, Corps of Engineers, that this locality is worthy of improvement. The work proposed contemplates the removal of snags

between Sabine Lake and Sudduths Bluff, at an estimated cost of $10,000. After the snags are removed $2,000 will be required annually to keep the river in good condition.

The report of the preliminary examination containing sufficient information to indicate to Congress the probable cost of the work required, no further survey appears to be necessary at this time.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

HON. REDFIELD PROCTOR,
Secretary of War.

PRELIMINARY EXAMINATION OF SABINE RIVER, TEXAS, FROM WHERE SAID RIVER EMPTIES IN SABINE LAKE TO SUDDUTHS BLUFF, ON SAID SABINE RIVER.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., September 3, 1891.

GENERAL: I have the honor to submit the following report of a preliminary examination made by me on August 27, 1891, of Sabine River, Texas, "from where said river empties in Sabine Lake to Sudduths Bluff, on said Sabine River," provided for in the river and harbor act approved September 19, 1890.

Upon referring to the Chief of Engineers' Report for 1873, pages 680-684, it will be observed that a detailed survey of the Sabine River from Sabine Lake to Belzora, Tex., was made between October, 1872, and April, 1873. The report states that the condition of the river is such that an expenditure of $18,000 for its improvement from Hamilton down would be warranted. In 1879 a resurvey of this portion of the river was made and the report appears in Chief of Engineers' Report for 1880, pages 1195-1200. In 1880 a contract for the improvement of the Narrows, a portion of the river about 18 miles long, was made, and work was commenced in 1881, pages 1321-1322, Report of the Chief of Engineers for 1881.

This work was completed the following year, and in 1883 the officer in charge reported: "The river now is in as good condition, so far as improvement is concerned, as it can be made, and is likely to remain so for several years." (Chief of Engineers' Report for 1883, p. 1056.) No further improvement of the river was recorded until 1889 (Chief of Engineers' Report, 1889, p. 1494), when it was recommended that the money available, $4,521.66, be expended in removing snags. A contract for the construction of brush dams in Old River, so as to throw all the water into the Narrows, was made in 1889 and the work was completed in 1890.

As a result of this damming of Old River the amount of water diverted into the Narrows has caused a good deal of caving in of the banks, and the trees thrown into the river in this way have caused a great many snags, which obstruct the channel.

A good many saw logs on the way to the mills at Orange, Tex., are caught by these snags and add to the difficulties of navigation. These snags lie mostly in the deep-water bends and force the steamboats over to the shoal water on the opposite shore. Their removal would consequently give a deeper channel for the use of steamboats than can be had at present.

Below Sudduths Bluff there is another place which requires cleaning out some, and several trees on the banks should be removed.

Below Orange to the lake no improvement is needed, as the river is deep.

Since the principal difficulty at present which navigation has to encounter in the river between Sabine Lake and Sudduths Bluff is shoal water, caused by the snags, etc., which obstruct the channel, I do not think any detailed survey is required. The removal of the snags between the points named will cost $10,000.

About 8,000 tons of freight came down the river last year, and it is expected that nearly as much more will be shipped this way the present year, as more boats will be in this trade.

The products shipped by water are cotton, corn, rice, cotton seed, and general merchandise, and an immense amount of logs for the mills at Orange, where they are manufactured into lumber. The annual output of the mills is about 120,000,000 feet of lumber, 30,000,000 shingles, and 10,000,000 lath and pickets.

The removal of the snags will meet the requirements of the river commerce for the present, but it is not expected that this improvement will be permanent. It will require $2,000 a year to keep the river in condition after the snags are removed.

Respectfully submitted.

JAMES B. QUINN,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

[Third indorsement.]

OFFICE U. S. ENGINEER,
New Orleans, La., September 24, 1891.

Respectfully returned to the Chief of Engineers, U. S. A.

In addition to the within, I have the honor to state that, in my opinion, the locality is worthy of improvement.

JAMES B. QUINN,
Major, Corps of Engineers.

(Through Col. C. B. Comstock, Corps of Engineers, Division Engineer, Southwest Division.)

[Fourth indorsement.]

U. S. ENGINEER OFFICE,
SOUTHWEST DIVISION,
New York, September 29, 1891.

Respectfully returned to the Chief of Engineers.

In my opinion the river is worthy of improvement by the removal of bad snags.

C. B. COMSTOCK,
Col. of Engineers, Bvt. Brig. Gen., U. S. A.,
Division Engineer.

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52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc. No. 21.

MURDERKILL RIVER, DELAWARE.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING,

With a letter from the Chief of Engineers, copy of a report of the preliminary examination and survey of the Murderkill River, Delaware.

JANUARY 5, 1892.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 17, 1891.

SIR: I have the honor to inclose herewith a letter from the Chief of Engineers dated December 16, 1891, together with copies of reports from Maj. W. F. Smith, United States agent, Corps of Engineers, retired, dated December 10, 1890, and December 2, 1891, of a preliminary examination and survey of Murderkill River, Delaware, made by him in compliance with the provisions of the river and harbor act of September 19, 1890.

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 16, 1891.

SIR: I have the honor to submit herewith copy of reports, dated December 10, 1890, and December 2, 1891, respectively, upon preliminary examination and survey of Murderkill River, Delaware, made by Wm. F. Smith, United States agent, Major of Engineers, U. S. Army, retired, in compliance with provisions of river and harbor act approved September 19, 1890.

The proposed improvement of Murderkill River contemplates the formation, by dredging, of a channel 7 feet deep at low water from Frederica to the 7-foot curve in Delaware Bay 80 feet wide down to the

mouth, and 150 feet wide at bottom and 250 feet wide at top from the mouth to the 7-foot curve in the bay; the cut at the mouth to be protected by forming an embankment of the dredged material on each side to a height of at least 2 feet above high spring tides. The cost of this work is estimated at $47,550.

The maps, being very large, are retained in the office of the Chief of Engineers.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. L. A. GRANT,
Acting Secretary of War.

PRELIMINARY EXAMINATION OF MURDERKILL RIVER, DELAWARE.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., December 10, 1890.

GENERAL: In compliance with the instructions contained in Department letter of September 20, 1890, and the requirements of section 17 of the river and harbor act of September 19, 1890, I have the honor to submit the following report upon the preliminary examination of Murderkill River, Delaware, made under my direction by Mr. A. Stierle, assistant engineer.

In view of the facts and for the reasons set forth in the report of the assistant, a copy of which is herewith inclosed, Murderkill River, Delaware, is, in my opinion, worthy of improvement, and I recommend a survey of it.

The least amount required to make the survey to include the mouth and extending up the river for a distance of 10 miles, and report with project and estimate of cost of improvement, is $600.

Very respectfully, your obedient servant,

WM. F. SMITH,
United States Agent.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., December 12, 1890.

Respectfully submitted to the Chief of Engineers.

Because of the facts and reasons set forth in the report of December 10, 1890, by the local engineer, and in view of the present and prospective needs of commerce, I have to state, as required by section 18 of the river and harbor act of September 19, 1890, that in my opinion Murderkill River, Delaware, is worthy of improvement by the United States, provided the rights of the Navigation Company, if still existing, to collect tolls, etc., be fully relinquished.

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

REPORT OF MR. A. STIERLE, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., December 9, 1890.

SIR: In compliance with your instructions I have the honor to submit the following report upon the preliminary examination of Murderkill River, Delaware.

Murderkill River is in Kent County, Delaware, and flows in a general northeasterly direction into Delaware Bay. Its sources lie near the Maryland State line, and consist of several large fresh-water branches, which unite about 16 miles above the mouth, at Fork Landing, from which point on downward the river assumes the characteristics of a tidal stream. The river is navigable for vessels drawing 5 feet at high water nearly as far as the tide flows. It is rarely, however, that any of them go above the town of Frederica, situated about 11 miles above the mouth of the river.

The course of the Murderkill was formerly a very sinuous one after it leaves the more elevated country at the head. Its bends and reaches were long and shoal, and would often, after flowing a long distance in every conceivable direction, return upon themselves to within a distance of several hundred feet. It was natural, therefore, that in early times those interested in its navigation entertained the idea of shortening the distance by means of artificial cuts connecting the different bends, and for that purpose the Murderkill Navigation Company was formed and chartered by the State of Delaware. Six cuts or canals were made by this company, the first one in 1820, the others at various dates up to 1879. The same company also had a channel dredged across the mud flats at the mouth of the river. The total amount expended by the company was about $10,000. This sum was in return partly recovered by the collection of tolls from all vessels navigating the stream, one of the privileges granted by the charter. These canals were not only made, as said before, to shorten the distance, but, I was told, also for the purpose of avoiding the numerous shoals within certain reaches whose bottom is principally hard clay, difficult to remove. The latter object, though a very plausible one, is the immediate cause why these cuts appear to be rather promiscuously located if their direction with reference to the adjoining bends only is considered.

The result of the six canals, which have an aggregate length of 6,000 feet, has been to shorten the length of the stream about 5 miles and to give a deeper channel. There is now a depth of 5½ feet at low water at the shoalest places in the river, whereas it was formerly only 4 feet. Nevertheless the river is undergoing a gradual deterioration, for the simple reason that several of the old bends have been filled up and the cross sections of the cuts being considerably less than those of the old river, the total capacity of the stream has been reduced in a very large degree. The improvements made by the company, which for the time being appeared to afford relief, indirectly contribute to the eventual destruction of the river for want of a proper understanding of the principles involved in the improvement of tidal rivers. The entrance to the river is obstructed by mud flats extending for a mile from the shore, over which there is a minimum depth of 1 foot at low water. The tide rises about 4½ feet. These flats form the only serious obstruction to navigation, and besides the removal of several shoals inside and a proper rectification of the course of the river, the people interested in the commerce of the Murderkill desire the construction of a new entrance, allowing vessels to pass in and out at all stages of the tide. A 7-foot low-water channel would answer the present needs.

An examination of this stream was made in 1881 under the direction of Col. William Ludlow, Corps of Engineers, and its needs very clearly set forth in a report printed in the Annual Report of the Chief of Engineers for 1882, p. 817 *et seq.* This report presented, besides suggestions for the improvement of the river, several plans for a new outlet. It is understood that no action to carry out this project was subsequently taken, because the right to improve the stream was at that time still vested in the improvement company chartered by the State. Ex-Governor John W. Hall, one of the directors, has informed me that the company has since been dissolved.

The country around the Murderkill is an extremely fertile one, and contains some of the finest farms in the State. It is at present in the center of the peach belt, and the cultivation of this fruit is carried on upon a large scale. Frederica, with a population of about 800, is the only town on the river. It is a thriving business place, with two large canneries, one shipyard, and thirty-eight stores, including those in the country contiguous thereto.

The white-oak timber growing about the headwaters of the Murderkill is considered the best in the State of Delaware, and for years back shipbuilding has been quite an industry at Frederica, the vessels built here being rated first class by the underwriters, on account of their strength, material, and workmanship. A large schooner 175 feet in length was recently launched. From three to four vessels are built every year. Twenty large seagoing schooners are owned here, but do not trade into the river on account of the limited depth of water in the channel and at the

mouth. Six light-draft vessels, owned at Frederica, trade regularly in and out of the river, and six transient vessels make irregular trips during the year.

The enterprising spirit of the citizens has been amply shown by the large amount of money expended on their own account for the improvement of navigation. The following commercial statistics, however, illustrate the extent of the present commerce, and may prove the necessity that existed and still exists for these improvements. These statistics were kindly furnished by Mr. Caleb J. Smithers, secretary of a committee of citizens of Frederica, headed by Ex-Governor Hall:

Average amount of trade per annum at Frederica, Del.

Wheat	bushels..	100,000
Corn	do....	150,000
Peaches, apples, and pears	baskets..	500,000
Berries	quarts..	1,000,000
Tomatoes, corn, peaches, and pumpkins	cans..	2,000,000
Potatoes	baskets..	50,000
Cabbage	barrels..	1,000
Turnips	baskets..	5,000
Timothy and salt hay	tons..	500
Wood	cords..	2,000
Railroad ties		50,000
Pine and oak piling		7,000
Pine and hemlock timber	feet, B. M..	400,000
Oak ship timber	do...	500,000
Phosphate	tons..	2,000
Coal	do...	1,500
Solder	do...	30
Stone, brick, and tile	do...	150
Tin plate	boxes..	7,000
Bar copper	pounds..	500
Lime	bushels..	50,000
Tomato crates		85,000
Calves and sheep	head..	500
Poultry and eggs to the value of		$40,000
General merchandise and agricultural implements to the value of		$200,000

I estimate the cost of a survey to include the mouth and 10 miles of the river at $600.

Very respectfully, your obedient servant,

A. STIERLE,
Assistant Engineer.

Gen. WM. F. SMITH,
United States Agent.

SURVEY OF MURDERKILL RIVER, DELAWARE,

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., December 2, 1891.

GENERAL: In compliance with instructions contained in Department letter dated December 15, 1890, I have the honor to submit the following report upon the survey of Murderkill River, Delaware, made under my direction in accordance with the requirements of the river and harbor act of September 19, 1890.

The streams emptying into the lower part of Delaware Bay from the State of Delaware have, as a general rule, very crooked channels cut through the mud, and are without much of a body of fresh water for their origin. The soil through which they run is generally stiff enough to maintain banks with steep slopes, and the cutting which has been done in the way of improvement is, as a general rule, very durable. Being only arms of the sea, the more the straitening process is applied to them the better they are scoured by the tide. The St. Jones River

is an example. There was no tide at Dover, the head of navigation, when the improvement of the river was begun; now the tide is regular and considerable.

The great obstacle at the entrance into Delaware Bay of the Murderkill and other streams is the drifting of the sand of the bay driven against the shore in an inclined direction to the course of the same. This tends, first, to make a large flat along the shore, and second, to drive the mouths of the various streams up or down the bay, according to the direction of the moving sand or to close them entirely when there is no fresh water supply to gather head and force a way through.

The plan for the improvement of the channel of the stream is simple; that for benefiting the mouth is more complicated and not so certain in results. For the Murderkill, from the mouth to Frederica, I would recommend that a channel be cut 80 feet in width and 7 feet in depth at low water. For the improvement of the water way from the mouth of the river into the 7-foot curve in Delaware Bay, I would recommend a cut 250 feet in width at the top with a width of 150 feet at the bottom, the material to be deposited on either side the cut to make an embankment to be at least 2 feet above high spring tides. The cut at the mouth of the St. Jones River gives hopes that such a plan will afford a cheap method of keeping navigation fairly good to the town of Frederica.

The alternative of a jetty seems too expensive for the present or prospective demands of commerce, and the cut proposed can be kept open by a small amount spent in dredging every three or four years.

A copy of the report of Mr. A. Stierle, assistant engineer, accompanies this, and the map* of the survey will be forwarded in a few days.

ESTIMATES.

For work inside the bar at the mouth of the Murderkill:	
Dredging 200,000 cubic yards of material, at 14 cents	$28,000
From the bar to the 7-foot curve in Delaware Bay:	
Dredging 115,000 cubic yards of material, at 17 cents	19,550
Total	47,550

Very respectfully, your obedient servant,

WM. F. SMITH,
United States Agent.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. William P. Craighill, Corps of Engineers, Division Engineer, Southeast Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., December 3, 1891.

Respectfully submitted to the Chief of Engineers.

The plan of improvement of the district engineer is recommended for approval. * * *

WM. P. CRAIGHILL,
Colonel, Corps of Engineers.

*Not printed.

REPORT OF MR. A. STIERLE, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Wilmington, Del., November 25, 1891.

SIR: I have the honor to submit herewith a report upon the survey of Murderkill River, Delaware, with projects for the improvement of the same.

The report on a preliminary examination, submitted December 10, 1890, contains all the information necessary relating to the benefit that would accrue to commerce and navigation if this river was improved, and I would respectfully refer to it in connection with the present report.

The survey was made during the month of September last, and extended from the bridge at Frederica to the mouth of the river, and along the bay shore for about 1 mile above and below the mouth, inclusive of the off-shore hydrography to the 7-foot depth in the bay. As the town of Frederica forms the present head of navigation for large vessels, the part of the river above the bridge was not included in the survey. The shore and sounding lines within the river were located entirely by stadia measurements, on account of the lack of time and the limited funds.

Two tidal stations were established, one at the wharf at Frederica, the other just inside the mouth of the river. Observations were made at the first-named gauge for twenty days, and at the latter for twenty-eight days, covering a lunar month. The average rise and fall of the tide at the mouth of the river for the period of observations was found to be 3.83 feet; at Frederica it was 1.08 feet.

About 4 miles above Frederica, at a point called Fork Landing, the river divides into two large branches. The northerly branch, running principally through a swampy country and named Big Ditch near its extremity, is about 10 miles long. The southerly or Brown's Branch is about 8 miles long. Tidal influence is felt for a distance of about 2¼ miles above the junction of the branches, but is feeble, the average rise and fall being less than 1 foot. The channel depth above Frederica, however, is such that boats of light draft and lighters can and do use it at high water. Not many years ago sailing vessels ran up to Fork Landing, which was then the most prominent shipping point on the river. Competition with other landings further down, a steady increase in the tonnage of the vessels navigating the river, and a slow deterioration of the upper channel finally compelled its abandonment.

The Murderkill, like all the rivers in Delaware flowing through broad marshes, was once unquestionably a large estuary with a powerful tidal volume and a much greater capacity than now. In a reciprocal relation the outlet must have been deeper and wider and was perhaps located further out, nearer the main channel of the bay. The wearing away of the bay shore, which in its retrograde movement eventually shifted the outlet upon a flat fore shore the residue of a former marsh; the gradual growth and closing in of the marshes upon the sides of the river, reducing the width; the upland drainage and its deposits into the river imperceptibly but surely changed the character of the stream, until it has become in proportion to its length the most ill-conditioned river in Delaware.

As a more recent contribution to the deterioration of the river should be added the fruitless efforts that have been made during the past seventy years to improve the navigation by cutting off several long bends separated by narrow strips of land. The sinuosity of these caused the trip from the mouth to the head of navigation to be unusually tedious and laborious. During the period mentioned, six cut-offs or canals were dug, aggregating nearly 10,000 feet, which reduced the distance between the termini over 4 miles, but which reduced the tidal volume and the scouring force as well and that in a much greater proportion. The effects are apparent at the mouth of the river, which is choked by a sand bar, nearly dry at low water, across which the ebb currents are unable to maintain any perceptible channel, notwithstanding that efforts have been made to assist nature by dredging.

Another danger that, with the diminishing scouring power of the river, threatens to close the outlet altogether is the continual transport of sand towards the mouth of the river by the waves along the bay shore south of the entrance. This movement has been observed to take place invariably in the direction indicated, even when winds from an opposite direction prevail. The small cape which is forming on that side is gradually receding up the river, and is projecting more and more into and across the channel, throwing up a dam which, if the opposite shore does not wear away correspondingly, will eventually prevent the tide from going in and the drainage water from going out, making a standing pool of the Murderkill, unless remedial measures are taken. It is the same impending fate that has already overtaken Cedar Creek and Prime Hook Creek, both once navigable streams, with their outlets on the same shore further south.

The distance from the mouth of the river to the bridge at Frederica is, measured along the canals, 47,500 feet, or 9 miles; along the old bends that were cut off it was 70,100 feet, or 13.2 miles, a difference of 4.2 miles, which represents the amount the river was shortened by the canals. The flats outside the mouth of the river are

nost bare at low water, and slope very gradually towards deep water in the bay til the 3-foot depth is reached, when the descent becomes steeper. The 6-foot ntour lies about three-quarters of a mile from the shore. The entrance to the er is funnel shaped, very narrow at the inner base, where the width from shore shore is 90 feet, the maximum depth in the channel being 8 feet at low water. mediately beyond this contraction the width of the river between the banks reases gradually, and averages 150 feet for the next 2¼ miles, the average depth the channel being 7.8 feet, with maximum and minimum depths of 13.5 and 3.8 t respectively.

The width of the remaining section of the river as far as Frederica is, with the ception of where canals were made, remarkably uniform, averaging 90 feet. The an depth decreases slightly before the first canal is reached, but from there up it mains at about the same average of 6.2 feet.

About 20,200 feet above the mouth is the lower end of the first canal, Lowber's, de in 1870. It is 1,300 feet in length and 50 feet in width and has a depth of 9 t at low water. The length of the bend cut off by this canal is 7,700 feet. This nd is, like the others that were cut off, now gradually filling up, and has a depth 4 feet at low water.

From the upper end of Lowber's canal to the next, Cole's, is 1,000 feet. Cole's cut, de in 1854, is 1,500 feet long, 43 feet wide, and has a low-water depth of 5½ feet. e bend it avoided is a short one, 2,700 feet in length, and contained a hard shoal th less than 3 feet of water over it at low tide.

The distance along the river between Cole's canal and the following one is 900 feet. e latter, being the longest of all and therefore commonly called Long Cut, was iginally Warren's canal, made in 1830. The upper half was dug in a deflected rection from the lower. Its length is 2,500 feet, the general width 50 feet, and the pth at low water 7.5 feet. This canal shortened the old bed of the river 7,800 t; the old course is fast filling up.

In continuation of Warren's canal, and just across the river, is the outlet of Walk- 's canal, made in 1820. Its length is 1,200 feet; its width 55 feet, and the average pth 8 feet. The bend of the river cut off by this canal was 5,200 feet long and s almost entirely closed up, being to-day only a narrow shallow drain.

Opposite the upper end of Walker's canal is Bradley's canal, with a direction ghtly turned to the southward. It was dug during the year 1879, comparatively recent date, and is 1,950 feet long. The average width is 40 feet and the depth water at low tide 8 feet. About 3,700 feet of the former course of the river were vered from the rest by this cut-off. The bend itself was not extraordinarily ooked and possessed a uniform curvature.

From the upper terminus of this canal to the next and last one happily extends a ach of the river which is 4,600 feet in length. The meanderings of the river begin lose their great depth and long sweep as they approach the mainland. The upper- ost of the canals, the West canal, was excavated in 1853 to avoid a bend in the er 4,700 feet long, which almost returned upon itself. The canal is 675 feet long, feet wide, and has an average depth of 7.5 feet. From this canal up the course the river is comparatively straight.

The tidal data offer excellent means for arriving at conclusions relative to the con- tion of a river and generally show the extent to which the unfavorable features of e same can be ameliorated by proper improvements. As the entrance to the St. nes River is only 3,000 feet above that of the Murderkill and has been recently proved, together with the whole river, a comparison of the tidal observations made the mouth of the Murderkill with similar observations made at the mouth of the . Jones nearly three years ago will more fully show the enfeebled state of the tide the former and assist to verify the deductions previously enumerated in this re- rt.

The time of high water and its rise to a common plane is the same at both rivers. e duration of rise, which is five hours, and of fall, which is a little over seven urs, is also nearly the same; the flood being three minutes shorter and the ebb six nutes longer at the Murderkill. The stands at both low and high water are one- lf as long in duration at the St. Jones; indicating a rapid transition from one ase of the tide to the other and a freer waterway for the tide to move in. This t characteristic is further illustrated by a glance at the ebb tide. Whilst in the . Jones the law of the fall of the ebb tide is represented by a smooth symmetrical rve from one stand to the other, one similarly constructed for the Murderkill is nsiderably distorted, particularly so during the last hours. For about three and ree-fourths hours after high water the tide falls in the same ratio at both gauges. e ebb at the St. Jones then continues to fall in accordance with the usual laws served, but the ebb in the Murderkill suddenly comes to nearly a stand, falling for e remaining three and one-half hours only five-tenths of a foot, during which time e ebb in the first river has still to go down 1½ feet to reach its low-water plane. other words, the low-water plane lies 1 foot lower in the mouth of the St. Jones an in the mouth of the Murderkill, which was verified by a line of levels run be-

tween the gauges and by the observations, which give the mean rise and fall 4.8 feet and 3.8 feet respectively.

It is evident that as both estuaries are of about the same length, 21 miles, with surrounding conditions similar in every respect, the St. Jones River is at present the superior receptacle for receiving and holding a large tidal volume. The comparatively small amount of water entering the Murderkill River during the five hours of the flood tide recedes again in the same number of hours, giving the lower section of the river the appearance of a mill race that has been shut off.

In the upper part of the Murderkill River the average depth in the channel is, as stated before, 6.2 feet, yet the tide rises and falls only 1 foot at a point 8 miles above the mouth. By analogy with other Delaware rivers it should not be less than 3 feet at this distance. This clearly proves the retardation of the tide, first, by the shoals at the mouth, and, second, by the narrow canals, which successively throttle it during its progress. Only an inadequate amount of water can get through these gorges during a flood epoch, and I am convinced that Walker's canal is in that respect the most injurious of all, as the old river bed that passed around it and which formerly offered a passageway for the tide is now closed up.

It is obvious that, with the obstructions at the mouth removed, a proper increase given to the width of the artificial canals, and by dredging shoals and by rectifying the shore lines in the upper river, the tidal volume of the river can be increased to such an extent as to add 1 foot to the rise and fall of the tide at the mouth and 2 feet at Frederica. Greater permanency in maintaining a proper channel depth would thereby be insured.

The project herewith submitted is for a 7-foot low-water channel from the 7-foot depth in Delaware Bay to the wharves at Frederica. The proposed cut across the flats at the entrance of the river is about 5,170 feet long, and in order to give it a cross-sectional area of the same size as the average one in the lower part of the river its width has been fixed at 150 feet. It will require the removal of 115,000 cubic yards of material to make this cut. The width proposed for the channel everywhere inside the river is 80 feet. There are shoals that need dredging to the projected depth and all the canals have to be widened, which will require a total of 200,000 cubic yards of dredging.

The cut at the mouth is made to converge towards the cut leading out of the mouth of the St. Jones River, so that in the future both may be brought together in one. A more rational, but also more costly and elaborate, project for a new and improved outlet would be to lead the Murderkill River into the St. Jones River by cutting across the intervening neck of land occupied by Bowers Beach village, joining both a short distance above the steamboat wharf. The junction would naturally form a small land-locked harbor for the numerous small vessels and boats plying upon the bay. It would cost less in the end to make and maintain a well-protected single outlet for both rivers as thus outlined, but there is, without any very tangible reason, a very strong local opposition on the part of the people living on the Murderkill side against a united outlet.

It is proposed to deposit all the material to be dredged from the proposed cut along the south side of the same, to form an embankment, that will serve as a nucleus for future protective works. The cut at the St. Jones River will have to be similarly protected on the north side. With the in and out going currents thus confined, it is thought that the formation of a bar at the extreme offshore ends of both cuts can in a great measure be prevented.

ESTIMATE.

200,000 cubic yards of dredging within the river, at 15 cents	$30,000
115,000 cubic yards of dredging at the mouth, at 20 cents	23,000
Total	53,000

Very respectfully, your obedient servant,

A. STIERLE,
Assistant Engineer.

Gen. WM. F. SMITH,
United States Agent.

52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { EX. DOC. No. 22.

WEST GALVESTON BAY, TEXAS.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING,

With a letter from the Chief of Engineers, report of the examination and survey of West Galveston Bay, Texas, from Christmas Point.

JANUARY 5, 1892.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 15, 1891.

SIR: I have the honor to inclose herewith a letter from the Chief of Engineers, dated December 11, 1891, together with copies of reports from Maj. Charles J. Allen, Corps of Engineers, dated December 12, 1890, and November 27, 1891, respectively, of a preliminary examination and survey of West Galveston Bay, Texas, from Christmas Point, with a view of reopening the channel through West Bay, made by him in compliance with the provisions of the river and harbor act of September 19, 1890.

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 11, 1891.

SIR: I have the honor to submit herewith copies of reports, dated December 12, 1890, and November 27, 1891, respectively, upon preliminary examination and survey of West Galveston Bay, Texas, from Christmas Point, with a view of reopening the channel through West Bay, made by Maj. Chas. J. Allen, Corps of Engineers, in compliance with provisions of river and harbor act approved September 19, 1890.

The proposed improvement contemplates straightening and slightly deepening the channels and removing the points bordering them, by

dredging, so as to afford a least width of 200 feet and depth of 3½ feet in West Bay between the railroad bridges, near Galveston, and San Luis Pass, and a least width of 100 feet and depth of 3 feet in Oyster Bay along Christmas Point; and marking the channel by beacons. The total cost of this work is estimated at $28,998.80.

The map being very large is retained in the office of the Chief of Engineers.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. L. A. GRANT,
Acting Secretary of War.

PRELIMINARY EXAMINATION OF WEST GALVESTON BAY, TEXAS, FROM CHRISTMAS (CHRISTIANS) POINT, WITH A VIEW OF REOPENING THE CHANNEL THROUGH WEST BAY.

UNITED STATES ENGINEER OFFICE,
Galveston, Tex., December 12, 1890.

GENERAL: I have the honor to submit the following report of a preliminary examination of "West Galveston Bay, from Christians Point, with a view of reopening the channel through West Bay," made in compliance with the requirements of sections 17 and 18 of the river and harbor act of Congress approved September 19, 1890.

West Bay is an expanse of water between Galveston Island and the mainland, and extending from Galveston Bay to San Luis Pass. Between West Bay and Bastrop and Oyster bays is Mud Island. (Please see United States Coast Survey Chart No. 105.)

The point of land between Oyster and Bastrop bays is noted on that chart as Christmas Point, though it is sometimes called Christians Point.

Oyster Bay is connected with the Brazos River by a canal executed by a private corporation. This canal, I am informed, is now undergoing deepening to maintain a 5-foot depth of water.

An examination of West Galveston Bay was made in November last under my direction by Mr. R. B. Talfor, assistant engineer. The following, quoted from his report of the examination, shows the present condition of the channel and, approximately, the extent of obstruction to a 5-foot navigation:

In accordance with the above instructions I left Galveston at 8:30 a. m. of the 27th with the schooner *Andrew Boden* for Christmas Point, via West Galveston Bay. The first obstruction to a 5-foot navigation was encountered at the Deer Islands, where but 3 feet was found in the steamboat channel, the tide at the time, 10 a. m., 27th instant, being approximately about three-fourths of a foot below mean low tide, with a bottom width of from 50 feet to 100 feet (approximately) for a distance of about one-half a mile. Second obstruction was found at Caronkaway Reef, 7 miles southwest of the Deer Islands, over which 3½ feet was the least depth found. The present steamboat channel is about three-fourths of a mile to the northward of the old dredged cut which was filled up by the cyclone of 1875. The present channel through the reef is quite lumpy for a distance of about three-fourths of a mile, with about 3 feet of water on the lump at mean low tide. Third obstruction is at Shell Island, which lies about three-fourths of a mile southwest of Caronkaway Reef, on which is about 3 feet of water at mean low tide; length of shoal about one-fourth mile. Fourth obstruction is about 1½ miles north of San Luis Pass, on which was found 4 feet of water (12 m., 27th instant), tide approximately at mean low; length of shoal about one-half mile. Fifth obstruction is in Oyster Bay, about three-fourths of a mile to the southwest of Christmas Point, where the channel last dredged makes a sharp angle with the general line of the cut (see chart). Three feet was the shoalest depth found at this point, its length from 5-foot contour to 5-foot contour being about one-half mile.

It appears from paper (copy herewith) received from Mr. Branch T. Masterson, of Galveston, that the State of Texas in 1859 had a channel dredged across Deer Island, Shell, Carancahua (Caronkaway), and Christian Point reefs, and that the channel remained open sixteen years until its depth and width were reduced by the cyclone of 1875. Also, that this channel, when open, furnished an outlet to market for the crops of Brazoria County, which now has a population of 11,000, as well as of the most thickly settled part of Matagorda County and the lower part of Fort Bend County; in fact, for all freight tributary to Brazos River and Chocolate and Bastrop bayous and Oyster Creek. That the partial closing of the channel by the cyclone of 1875 forces a large part of the traffic to be carried on by hauling to the river and by boating to Columbia, about 40 miles above the mouth of the river, thence by railroad to Houston and Galveston, causing loss of time and additional expense to farmers in shipping their produce to market. That notwithstanding the delay in waiting for high tides to enable crossing the reefs, one steamboat brings to market large quantities of cotton and that it carries in return cargoes of merchandise. That a great deal of freight is also carried by sail vessels in the open Gulf by selecting times when the Gulf is sufficiently calm to take the risk, though insurance companies have declined to insure cargoes by the open Gulf route as being too hazardous for regular navigation by light-draft bay and river sail vessels or steamers. And that the reopening of the channel through the reefs will increase safety and speed in navigation and develop a constantly increasing trade.

From a statement also made by Mr. Masterson, December 6 (copy herewith), it appears that the value of the traffic through West Bay in one season from Brazos River alone amounted to $732,000. In that statement it is also claimed that one steamboat from the Brazos River (by this route) running constantly reduced freight charges 50 per cent.

It would appear from the report and statistics that the channel through West Galveston Bay to Christians (Christmas) Point is worthy of improvement by the General Government, provided the cost of such be not disproportionate to the extent of the traffic as stated.

The expense of a full survey from which to determine the practicability and cost of such improvement is estimated at $3,000.

Appended hereto are an extract from the report of Mr. Talfor and copies of statements by Mr. Masterson.

Very respectfully, your obedient servant,

CHAS. J. ALLEN,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. C. B. Comstock, Corps of Engineers, Division Engineer, Southwest Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
SOUTHWEST DIVISION,
New York, December 22, 1890.

Respectfully forwarded to the Chief of Engineers.

I concur in the opinion of the local engineer that this route is worthy of improvement. To what extent depends on the cost, which can only be determined by a survey.

C. B. COMSTOCK,
Colonel of Engineers, Bvt. Brig. Gen., U. S. A.,
Division Engineer.

REPORT OF MR. R. B. TALFOR, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Galveston, Tex., November 29, 1890.

SIR: I have the honor to report on a preliminary examination of the channels through West Galveston Bay to Christmas Point, per your letter of instructions on the 26th instant. In accordance with the above instructions, I left Galveston at 8:30 a. m. of the 27th with the schooner *Andrew Boden* for Christmas Point via West Galveston Bay. The first obstruction to a 5-foot navigation was encountered at the Deer Islands, where but 3 feet was found in the steamboat channel, the tide at the time, 10 a. m., 27th instant, being approximately about three-fourths of a foot below mean low tide, with a bottom width of from 50 feet to 100 feet wide (approximately) for a distance of about one-half a mile. Second obstruction was found at Caronkaway Reef, 7 miles southwest of the Deer Islands, over which 3½ feet was the least depth found. The present steamboat channel is about three-fourths of a mile to the northward of the old dredged cut which was filled up by the cyclone of 1875. The present channel through the reef is quite lumpy for a distance of about three-fourths of a mile, with about 3 feet of water on the lump at mean low tide. Third obstruction is at Shell Island, which lies about three-fourths of a mile southwest of Caronkaway Reef, on which is about 3 feet of water at mean low tide; length of shoal about one-fourth mile. Fourth obstruction is about 1½ miles north of San Luis Pass, on which was found 4 feet of water (12 m., 27th instant), tide approximately at mean low; length of shoal about one-half mile. Fifth obstruction is in Oyster Bay, about three-fourths of a mile to the southwest of Christmas Point, where the channel last dredged makes a sharp angle with the general line of the cut (see chart). Three feet was the shoalest depth found at this point, its length from 5-foot contour to 5-foot contour being about one-half a mile.

In connection with the above, I would respectfully refer to the fact that if the channels through the reefs were staked off with beacons similar to the one at Hannas Island in Galveston Bay, the present navigation would be greatly benefited thereby.

3 beacons at Deer Island.
3 beacons at Caronkaway Reef.
2 beacons at Shell Island.
2 beacons at San Luis Pass.
4 beacons at Christmas Point.

* * * * * * *

CHARACTER OF BOTTOMS.

At Deer Island, shell and mud; at Caronkaway, shell and mud; at San Luis Pass, sand; at Christmas Point, soft mud in channel, stiffer mud on sides of cut.

Attached herewith are commercial statistics furnished by Mr. Branch Masterson.

Very respectfully, your obedient servant,

R. B. TALFOR,
United States Assistant Engineer.

Maj. CHAS. J. ALLEN,
Corps of Engineers, U. S. A.

STATEMENT FURNISHED BY MR. BRANCH T. MASTERSON, NOVEMBER 6, 1890.

In 1859 the State of Texas had a channel dredged across Deer Island Reef, Shell Reef, Caranchua Reef, and Christian Point Reef, the balance of the entire distance through West Galveston Bay gives open water navigation for vessels drawing not exceeding 5 feet. This channel remained open until the cyclone of 1875, sixteen years, without a dollar's expense, and was constantly used. That cyclone by violent force of the water filled in the channel on the sides with sand and small shells until it became only from 2½ to 3 feet at low tide, and too narrow to pass through except at full tide. When this channel was open it furnished the outlet to market for the crops of Brazoria County, which now has a population of over 11,000 people, as well as the most thickly settled part of Matagorda and lower part of Fort Bend County, in fact all freight tributary to Brazos River and Chocolate and Bastrop bayous and Oyster Creek.

The trade kept two steamboats with carrying capacity of 500 bales of cotton each constantly employed, and numerous sail vessels and trading boats. The partial clos-

ing of the channel forces a large part of the traffic to be carried on by hauling to the river, boating to Columbia, about 40 miles from the mouth of the river, and thence to be hauled by railroad up to Houston and down to Galveston, causing loss of time and additional expense for farmers to get their freight or ship their products to market. Notwithstanding the delay of waiting for high tides to cross these reefs, one steamboat has brought to market over this route thousand bales of cotton from September 1, 1889, to May 1, 1890, and carrying returning cargoes of merchandise, and a large part of the freight was brought by sail vessels in the open Gulf by selecting times when the Gulf was sufficiently calm to take the risk. Insurance companies have declined to insure cargoes by the open Gulf route as being too hazardous for regular navigation by light-draft bay and river sail vessels or steamers.

The reopening of the channel through the reefs will increase the safety and speed in navigation and develop a constantly increasing trade. This would require at Deer Island Reef dredging from 1 to 3 feet deep, 60 feet wide, 800 yards long; at Shell Reef, about 400 yards long; at Carancahua Reef, about 600 yards long, and Christian Point Reef, about 500 yards long. When the State of Texas dredged this channel in 1859 no timber or other material was used to prevent the filling up, the ebb and flow of the tide through the channel keeping it open without expense until partially filled in by shell and sand moved by the cyclone in 1875.

LETTER OF MR. BRANCH T. MASTERSON, ATTORNEY AT LAW.

GALVESTON, TEX., *December 6, 1890.*

DEAR SIR: In response to your inquiry as to the extent of the traffic to be benefited by opening the channel through the reefs in West Bay, I beg to report that in one season the traffic from Brazos River alone was as follows:

Sugar, 2,240 hogsheads	$224,000
Cotton, 3,600 bales	216,000
Molasses, 2,500 barrels	50,000
Hides, 8,000	30,000
Lumber, 445,000 feet	9,000
Merchandise, 20,300 barrels	203,000
Total	732,000

This only includes the freight of light-draft steamers, and would easily be doubled but for the fact that in low tides in winter, when the bulk of the crop is marketed, the steamers frequently take a week waiting for tides to cross the reef, and all freight that requires prompt and certain delivery could not come by the bay route. The commerce would not only be increased, but a reliable water route would result in greater competition and cheaper freight. One steamboat from the Brazos River running constantly has resulted in a reduction of 50 per cent in freight charges. In giving data I have omitted boats from Oyster Creek, Bastrop, and Chocolate bayous, as I have not the information as to them.

Very respectfully,

BRANCH T. MASTERSON.

Maj. CHAS. J. ALLEN,
Corps of Engineers, U. S. A.

SURVEY OF WEST GALVESTON BAY, TEXAS, FROM CHRISTMAS (CHRISTIANS) POINT, WITH A VIEW OF REOPENING THE CHANNEL THROUGH WEST BAY.

UNITED STATES ENGINEER OFFICE,
Galveston, Tex., November 27, 1891.

GENERAL: I have the honor to submit herewith my report of a survey of "West Galveston Bay, from Christians Point, with a view of reopening the channel through West Bay," made in compliance with the requirements of sections 17 and 18 of the river and harbor act of Congress of September 19, 1890.

In my report of the preliminary examination of the bay, dated Decem-

ber 12, 1890, I wrote, referring to certain statements forwarded with that report, as follows:

It would appear from the report and statistics that the channels through West Bay to Christians (Christmas) Point are worthy of improvement by the General Government, provided the cost of such be not disproportionate to the extent of the traffic as stated.

A full survey from which to determine the cost of improvement was made in March and April last, excepting that the shore lines of Deer Island were run during the past month.

The survey, covering 39 square miles, 24 of which were sounded, was made under my direction by Mr. Gerald Bagnall, assistant engineer, a copy of whose report upon the same is herewith. The sum of $2,000 was allotted me for the purpose of making the survey.

It was necessary to sound large portions of the bay closely, as there had been no survey of the locality since 1880, and it was important to ascertain what changes, if any, had occurred in channels since that year. It was claimed by some interested in the navigation of the bay that channels excavated through the shoals by the State of Texas in 1859 had been more or less filled up by the cyclone of 1875. It appeared, therefore, as not unlikely that the cyclone of 1886 might have caused further filling of the channels.

The act authorizes an examination or survey, or both, "from Christian's Point." From direct information gained it was evident that the point of land lying between Bastrop and Oyster bays and about 3 miles west of San Luis Pass was the point meant in the act. On the U. S. Coast Survey chart this point is marked as Christmas Point, by which name it is most generally known. The channel passing along the point is claimed to be the most difficult of navigation of any of the channels.

The survey commenced at a point between the railroad bridges which cross from Galveston Island to the mainland of Texas and Deer Islands, and extended to the west end of Oyster Bay, the whole being regarded as West Bay.

The ruling depth at mean low tide from the railroad bridges to San Luis Pass is 3½ feet, excepting at Karonkaway Reef, where, in a few places, it is 3.2 feet. For considerable distance there is a depth of 5 feet.

In San Luis Pass, which connects West Bay with the Gulf of Mexico, the depth is, according to U. S. Coast Survey chart, 7 to 8 feet. The ruling depth in Oyster Bay up to the entrance to the Galveston and Brazos Canal, which connects that bay with Brazos River, is 3 feet, excepting for a short distance, over which it is 2.8 feet. The depth in the canal has been increased by dredging during the past season, as I am informed, to 7 feet.

The average rise of the tide in West Bay is about 1 foot. During the prevalence of "northers" the depth in the bay is considerably less than that at mean low tide, and vessels are at such times subject to delay.

The canal is owned and operated by a private corporation, which has the right to exact tolls of vessels making use of it. Improvement of the mouth of the Brazos River is also carried on by a private corporation, which is empowered to collect tolls under certain regulations. Vessels entering Brazos River from the Gulf of Mexico, and conversely, pass through one or the other of these improvements.

The difficulty in navigating West Bay is due to insufficient depth, principally during "northers," and to narrow and tortuous channels at a number of points, as can be seen by inspection of the map* herewith.

* Not printed.

Those interested in improvement of West Bay are desirous of securing a depth of 5 feet in the channels at low tide. The cost of excavation to secure continuous channels of least width of 100 feet and of depth of 4 feet, also of 5 feet, is given below.

Following the line of the present channel, which is marked on the map *c, g, p, q, v*, there will be required, in order to obtain a depth of 4 feet, the excavation and removal of 216,029 cubic yards of material, at an estimated cost of	$95,052.76
For a 5-foot depth the quantity to be excavated and removed would be 501,112 cubic yards, at an estimated cost of	220,489.28
Following the most direct route through the bay, marked on the map *c, g, i, q, v*, the quantity of excavation required for a 4-foot depth would be 213,012 cubic yards; estimated cost	93,725.28
For a 5-foot depth, 480,155 cubic yards would have to be excavated, at an estimated cost of	211,268.20

The cost per cubic yard is placed at 40 cents on account of the distances through which the excavated material would have to be conveyed. To the cost of dredging has been added 10 per cent to cover contingencies of engineering and inspection.

The expense of dredging channels of the depths just given, and to a width of 200 feet, would be nearly double that of 100-foot channels.

The cost of any one of the foregoing is regarded as beyond proportion to the amount of present or immediately prospective commerce that would be benefited by such improvement.

There are two steamers at present navigating West Bay, carrying freight and passengers between Brazos River and Galveston. They are the *Whitewater*, with carrying capacity of 550 bales of cotton, and the *Emily P.*, of 150 bales capacity. A new steamer, the *Hiawatha*, of 1,200 bales capacity, has been purchased and is now on her way from New Orleans to be added to the line of steamers navigating the bay.

It is stated in the letter of Mr. Branch Masterson, vice-president of the line (copy of letter herewith), that the freight transported during the past ten months by one of the steamers aggregated about 4,000 tons, of an approximate value of $800,000. He could not state the total amount of freight in tons carried by the steamers or by the small sailing craft that also bring cotton and other produce from the Brazos to Galveston. It is his opinion that an improvement to admit of steamers crossing the reefs without waiting for high tide would result in more than doubling the commerce.

Considerable improvement of the navigation would result from straightening the channels and removing the points bordering them, and also from effecting a trifling amount of deepening by dredging so as to afford a least width of 200 feet and depth of 3½ feet in the bay between the railroad bridges and San Luis Pass, and least width of 100 feet and depth of 3 feet along Christmas (Christians) Point, following the line of existing channel *c, g, p, q, v*, the reason for the difference in width and depth for the two being that the former portion is navigated by more and larger sailing vessels than is the latter, which is principally used by the steamboats of the company, which are of light draft.

Such an improvement would call for excavation as follows:

Between the railroad bridges and San Luis Pass	cubic yards	48,740
In Christmas (Christians) Point Channel	do	11,040
		59,780
At 40 cents per yard		$23,912.00
Add 15 per cent for contingencies of engineering and inspection		3,586.80
Total for dredging		27,498.80

The material to be dredged is composed mostly of a mixture of mud, sand, and shells.

If an improvement is ordered, the channel should be marked by suitable beacons, the estimated cost of which is $1,500 in addition to that just estimated for dredging. These sums, aggregating $28,998.80, can, in my opinion, be profitably expended in the interest of the public in reducing the difficulties in the way of navigation through West Bay, and should Congress order the improvement the amount estimated ($28,998.80) can be profitably expended in one year.

A small amount of redredging might in time become necessary, though it is believed that dredging in West Bay will be reasonably permanent.

STATISTICAL.

The locality under survey is in the collection district of Galveston, Tex., at which port the revenue collected for the fiscal year ended June 30, 1891, was $174,489.92.

The nearest light-houses are at Half-Moon Reef and Redfish Bar, in Galveston Bay, and at Bolivar and Fort Point, at entrance to Galveston Bay.

There is a United States life-saving station at San Luis Pass, and also one at Fort Point.

Very respectfully, your obedient servant,

CHAS. J. ALLEN,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. C. B. Comstock, Corps of Engineers, Division Engineer, Southwest Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
SOUTHWEST DIVISION,
New York, December 9, 1891.

Respectfully forwarded to the Chief of Engineers.

The views of the district engineer are concurred in.

C. B. COMSTOCK,
Colonel of Engineers, Bvt. Brig. Gen., U. S. A.,
Division Engineer.

REPORT OF MR. GERALD BAGNALL, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Galveston, Tex., November 16, 1891.

MAJOR: I have the honor to submit the following report on the survey of West Bay and Christmas Point, made in accordance with your instructions, together with estimates for the construction of a channel.

The survey was commenced on March 2, 1891, and completed on April 18, 1891. The area surveyed embraces about 39 square miles, of which 24 square miles was sounded over. A system of triangulation connected with the triangulation stations in Galveston Bay was carried down to Karonkaway Point, and repeated angles read at each station. A base line 15,055.1 feet long was measured from △ 1 to △ 3, and the work checked at the lower end by a measured line from D to E. At Christmas Point a base line 2,820.8 feet long was measured from P to P′, and an independent system of triangulation laid out embracing 6 stations. About 55 miles of shore line was run in West Bay, and about 7 miles in Oyster Bay. The stations on shore had

tripods erected over them, while those in the water consisted of a simple pole with a ball on top. In West Bay 13 tripods were erected, including one at Virginia Point not shown on map, and 4 single poles. In Oyster Bay 4 tripods and 2 single poles were used. The location of the stations is marked on the ground by galvanized iron rods 7 feet long and boiler tubes, both being placed at the principal stations, while tubes only were put at the others.

TIDE GAUGES.

Five tide gauges were established in West Bay and one in Oyster Bay. In West Bay T. G. No. 1 was established on the railroad trestle, No. 2 north of Deer Island, No. 3 about 2 miles south of Deer Island, No. 4, 2 miles above Karonkaway, and No. 5 off Karonkaway Point.

A line of levels was run from the B. M. on the Hendley building to the railroad trestle across West Bay and connected with T. G. No. 1, at which hourly readings were taken night and day for two months. The other gauges were connected with this by comparisons of high and low water readings, the observations having been taken when practicable during the progress of the survey. As a check No. 1 was connected with No. 3 by a line of levels run down the island shore to a temporary gauge at the nearest point of shore, which was connected with the latter by water level comparisons. In like manner the result of comparisons between readings on Nos. 4 and 5 was checked. At Christmas Point it was not practicable with the means and time at our disposal to get a tide record covering a sufficiently long period by which to establish a correct plane of mean low tide. It was therefore thought best to use a plane deduced from the survey of 1880. The plane thus found and used was secured by a bench mark.

BENCH MARKS.

Bench marks were established on the nearest point of shore to each of these gauges and are as follows:

B. M. No. 2 is an iron bolt in center of an old 12 by 12 pile west of the first bent on the railroad bridge and on the southwest side of bridge 18 inches from present south pile of said bent.

B. M. *b* is a square-headed iron bolt driven to the surface of ground close to the iron tube at △ *b*. Its elevation above mean low tide is 4.210 feet.

B. M. No. 10 is a square-headed iron bolt driven to the surface of the ground near a bush on shell reef opposite station 3 and in line with station 3 and Galveston Water Tower. Its elevation above mean low tide is 3.645 feet.

B. M. No. 1 is a round iron bolt driven within 2 inches of the ground at Karonkaway Point and located by the following sextant angles:

7 and C.....43° 52′ 40″
C and 5.....30° 32′ 40″
5 and 6.....72° 58′ 40″

Its elevation above mean low tide is 3.965 feet.

B. M. No. 3 is located 1 foot north of B. M. No. 1. It is a square-headed bolt driven close to the surface of the ground. Its elevation above mean low tide is 3.801 feet.

B. M. No. 4 is an iron bolt driven within 2 inches of the surface of the ground and the main land opposite station X. It is located by the following angles:

7 and C.....20° 35′ 00″
C and 5.....34° 10′ 00″
A and B.....79° 18′ 00″

Its elevation above mean low tide is 3.597 feet.

The B. M. at Christmas Point is a square-headed iron bolt driven to the surface of the ground about 1 foot from the boiler tube at P. Its elevation is 5.545. The elevation of top of the boiler tube is 7.065.

The survey embraced those portions of the route between the railroad bridge at the northern extremity of West Bay and the entrance to the Brazos River Canal, where a depth of 5 feet could not be found. The width surveyed at the different points depended on the following conditions: Where the best route was well defined, as was the case near Deer Island, the area surveyed was limited to shoal water on each side of present channel; at points, however, where doubt existed as to the most economical route, as was the case about Karonkaway, the survey was then made to embrace nearly the full width of the bay.

ESTIMATES.

Estimates for a 4-foot and for a 5-foot channel 200 feet wide have been made over two lines, one following the most direct practicable route, the other following the present steamboat channel as shown by dotted line on chart. Another estimate has

been made for improving the present route to the extent of cutting off points and widening the passage through the reefs, giving a minimum depth in West Bay of 3½ feet at mean low tide, and in Oyster Bay a minimum depth of 3 feet at mean low tide. This latter estimate does not contemplate increasing the normal depths of the bays.

In making up the quantities an extra depth of 0.5 foot was added to cover unavoidable excess of depth of cutting. As this is a small margin the price per cubic yard has been slightly increased over what it would have been with a larger margin of depth.

The estimated cost has been placed high on account of the difficulty of disposing of the material in a shoal-water bay, combined with the light cutting required. The total length to be dredged, following the most direct route, is as follows:

	4-foot channel.	5-foot channel.
	Feet.	*Feet.*
In West Bay	34,555	53,85
In Oyster Bay	17,500	17,50
	52,055	71,35

The amount of material to be removed would be for a—

	4-foot channel.	5-foot channel.
In West Bay ..... cub. yds..	282,375	697,37
In Oyster Bay ..... do....	163,474	282,75
	445,849	980,13
At 40 cents per cubic yard	$178,339.60	$392,054.0
Add 10 per cent for contingencies	17,833.96	39,205.4
Totals	(1) 196,173.56	(2) 431,259.4

Following the present steamboat channel the amount to be dredged and cost would be as follows:

	4-foot channel.	5-foot channel.
In West Bay ..... cub. yds..	288,408	739,20
In Oyster Bay ..... do....	163,474	282,75
	451,882	1,022,04
At 40 cents per cubic yard	$180,752.80	$408,819.6
Add 10 per cent for contingencies	18,075.28	40,881.9
Totals	(3) 198,828.08	(4) 449,701.5

Estimated cost of widening through the reefs and cutting off points, etc.:

In West Bay ..... cub. yds..	48,740
Christmas Point ..... do....	27,600
	76,340
At 40 cents per cubic yard	$30,536.00
Add 20 per cent for contingencies	6,107.20
Total	36,643.20

The amount of work estimated for in the last case would provide sufficient depth for most if not all the commerce at present using these bays, except during severe northers.

A reduction of width of channel in the above estimates will give more than a pro-

portional reduction in the quantities. This is especially so in the case of estimate No. 5, where a reduction of width to 100 feet would reduce the amount to be excavated in the proportion of 2 to 5. In the case of estimates Nos. 1, 2, 3, and 4 this would be very much smaller.

The cost of dredging per cubic yard could be reduced by depositing the material alongside the cut, but while this might safely be done in Oyster Bay there would be danger of the material washing back in West Bay on account of its greater extent and depth.

The material in West Bay and Oyster Bay is principally composed of a mixture of mud, sand, and shell, with occasional reefs of oyster shell. It is probable that any channel dredged through them will maintain its depth fairly well, as the currents are in the direction of the proposed cut, but for greater permanency it would be necessary to revet each side of the dredged channel, at least in some places.

A further provision should be made for the erection of beacons at an approximate cost of $1.500.

Very respectfully, your obedient servant,

GERALD BAGNALL,
Assistant Engineer.

Maj. CHAS. J. ALLEN,
Corps of Engineers, U. S. A.

LETTER OF MR. BRANCH T. MASTERSON.

GALVESTON, TEX., *November 27, 1891.*

DEAR SIR: In response to your inquiry as to the present condition of the traffic passing through West Bay, I regret that from the nature of the trade it is impossible to state the exact tonnage, because a number of schooners are passing at irregular times when the high tides admit of their crossing the reefs, loaded with freight, going and coming, and when the steamboats running regularly are delayed by low tides in crossing the reefs, the freights are diverted and find their way to market by hauling to nearest points on railroads and paying the additional cost. I have taken from the books of one steamer, making one trip per week, the amount of freight transported by her in the past ten months, and find it aggregates about 4,000 tons, of an approximate value of $800,000. The owners of the boat found the traffic increasing so that within the past ninety days they have purchased another steamer and have been running four trips each way per week. Both steamers have had tendered them so much more freight than they can carry that a third steamer has been purchased within the past ten days, having a carrying capacity of 300 tons, and will be placed in the trade at once. The trade has doubled within the past ninety days, and if relieved of the delays caused by waiting for tides to cross the reefs in West Bay, I feel certain of a further increase of over 100 per cent by the coming season.

Very respectfully,

BRANCH T. MASTERSON.

Maj. CHAS. J. ALLEN,
U. S. Engineer.

52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc. No. 23.

HUDSON RIVER.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING,

With a letter from the Chief of Engineers, a copy of the report of the Board of Engineer Officers in relation to improvement of the navigation of the Hudson River.

JANUARY 5, 1892.—Referred to the Committee on River and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 8, 1891.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, dated November 20, 1891, together with a copy of report of a Board of Engineer Officers, dated October 1, 1891, appointed in compliance with the provisions of the river and harbor act of September 19, 1890, to—

thoroughly examine the obstructions to navigation in the Hudson River, between New York City and the State dam at Troy, New York, and report a project and estimate of the cost of widening and deepening said river between New York City and the city of Albany, and also between New York City and the State dam at the city of Troy, for the navigation of sea-going vessels drawing 20 feet of water, and also a separate estimate of the expense of improving the river between Coxsackie and the State dam at Troy, to such an extent as to secure a navigable channel 12 feet deep at mean low water.

The views expressed in the report of the Board are concurred in by the Chief of Engineers and by this Department.

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., November 20, 1891.

SIR: The river and harbor act approved September 19, 1890, provides as follows:

That the Secretary of War is authorized and directed to appoint a board of three officers of the Corps of Engineers, United States Army, whose duty it will be to thoroughly examine the obstructions to navigation in the Hudson River, between New York City and the State dam at Troy, New York, and report a project and estimate of the cost of widening and deepening said river between New York City and the city of Albany, and also between New York City and the State dam at the city of Troy for the navigation of sea-going vessels drawing 20 feet of water, and also a separate estimate of the expense of improving the river between Coxsackie and the State dam at Troy, to such an extent as to secure a navigable channel 12 feet deep at mean low water. Said Board shall accompany their report with a statement as to the usefulness of such improvements and of their relations and value to commerce, and of the advisability of entering upon the same at this time; and the Secretary of War shall transmit said reports to Congress with his own views and those of the Chief of Engineers, United States Army, thereon, and the expenses of said Board shall be paid out of the appropriation made in this act for the improvement of the Hudson River, not to exceed $10,000.

The Board of Engineers authorized and directed by the above law has completed the duty assigned it, and I have now the honor to submit the accompanying copy of its report dated October 1, 1891.

Three propositions looking to improvement of the navigation of the river were by the terms of the act to be considered by the Board and projects with estimates of cost required to be submitted.

1. Between New York City and the city of Albany, for the navigation of sea-going vessels drawing 20 feet of water.
2. Between New York City and the State dam at Troy, for the navigation of sea-going vessels drawing 20 feet of water.
3. Between Coxsackie and the State dam at Troy, for navigable channel 12 feet deep at mean low water.

Upon these three several propositions, the Board, after full and careful consideration, remarks as follows:

Concerning the first two—deep channels between New York City and Albany and between New York City and Troy—

The Board is of the opinion that the possible benefits to commerce to be derived from the proposed improvement for vessels drawing 20 feet are not, under existing conditions, sufficient to justify at this time the expenditure necessary to make such improvement.

* * * * * * *

The estimates of cost of carrying out the two projects contained in the said act, which provide for widening and deepening the channels between New York City and the city of Albany and between New York City and the city of Troy, for the navigation of sea-going vessels drawing 20 feet of water, are $5,934,847.60 and $19,507,832.74, respectively.

Concerning the third—channel 12 feet deep between Coxsackie and the State dam at Troy—

After carefully studying the wants of commerce, the Board is of the opinion that the third project contained in the act of September 19, 1890, which provides for improving the Hudson River "between Coxsackie and the State dam at Troy to such an extent as to secure a navigable channel 12 feet deep at mean low water," is a worthy and useful one, and accordingly recommends it for adoption.

* * * * * * *

In view of the necessities of the commerce incident to the river proper and its tributary country, the Board is of the opinion that the project for improvement adopted in 1867 should be extended so as to provide for a channel depth of at least 12 feet at mean low water, and that such an extension is well worth the expenditure required for its execution.

The estimate submitted by the Board for a channel 12 feet deep and 400 feet wide from Coxsackie to the foot of Broadway, Troy, and thence 12 feet deep and 300 feet wide to the State dam at Troy is $2,447,906.56.

I concur in the views of the Board.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. REDFIELD PROCTOR,
Secretary of War.

REPORT OF BOARD OF ENGINEERS ON IMPROVEMENT OF HUDSON RIVER, NEW YORK, IN COMPLIANCE WITH ACT APPROVED SEPTEMBER 19, 1890.

UNITED STATES ENGINEER OFFICE,
New York, N. Y., October 1, 1891.

GENERAL: The Board of Engineers constituted by Special Orders No. 66, Headquarters, Corps of Engineers, September 30, 1890, has the honor to submit the following report upon the improvement of the Hudson River, New York, to comply with the requirements of the river and harbor act of September 19, 1890.

The special duty required of the Board, in the language of the act, was:

To thoroughly examine the obstructions to navigation in the Hudson River, between New York City and the State Dam at Troy, N. Y., and report a project and estimate of the cost of widening and deepening said river between New York City and the city of Albany, and also between New York City and the State Dam at the city of Troy for the navigation of sea-going vessels drawing 20 feet of water, and also a separate estimate of the expense of improving the river between Coxsackie and the State Dam at Troy, to such an extent as to secure a navigable channel 12 feet deep at mean low water. Said Board shall accompany their report with a statement as to the usefulness of such improvements, and of their relations and value to commerce, and of the advisability of entering upon the same at this time; and the Secretary of War shall transmit said reports to Congress with his own views and those of the Chief of Engineers, U. S. Army, thereon; and the expenses of said Board shall be paid out of the appropriation made in this act for the improvement of the Hudson River, not to exceed $10,000.

As all the obstructions to the navigation of the river above the plane of 20 feet mean low water are situated between Hudson and Troy, the duties of the Board were confined to the consideration of the improvement of that reach. The river between those points was accordingly examined thoroughly by the Board in person, and a careful study has been made of all accessible charts which have been published.

To enable the Board to confer with all persons whose interests might be affected by the enlarged improvement of the river, a public meeting was held at Albany, N. Y., January 6, 1891, at which the attendance was very large. A second meeting was held in New York, May 15, 1891, to enable the commercial bodies in that city not previously represented to present their views.

The information gathered at these meetings in regard to "the usefulness of the improvements and of their relations and value to commerce and of the advisability of entering upon the same at this time" was all reduced to writing, and copies are appended hereto.

The improvement of the Hudson River by the State authorities ante-

dates the present century, but the part which the General Government has taken in it dates only from 1834, at which time the first appropriation, amounting to $70,000, was made.

A Board of United States Engineers, convened in that year, prepared a project for improvement which contemplated the construction of lines of longitudinal dikes from Troy to New Baltimore, supplemented by the use of the dredge.

The State of New York had previously followed plans of improvement which provided for the application of groins or jetties for contracting channel to induce scour.

Under the general system adopted by the United States operations for the construction of longitudinal dikes and for occasional dredging were carried on during the years 1835, 1836, 1837, and 1838. A suspension of work then occurred, and active operations on an extensive scale were not resumed until 1867, when work under the project prepared by the officer then in local charge was begun.

In the meanwhile the State of New York, in 1863, had taken up the improvement on the general plan adopted by the United States in 1834, and between 1863 and 1867 six longitudinal dikes were built on the left bank, extending from Houghtailing Island to Albany. The Annual Reports of the Chief of Engineers during the past few years show that the improvement by the construction of dikes has been left almost exclusively to the General Government, and that by dredging to the State of New York.

The existing plans of improvement, adopted in 1867, provide for securing a navigable channel 11 feet deep at mean low water from New Baltimore to Albany, and 9 feet deep at mean low water from Albany to Troy, at an estimated cost of $862,297.75. This estimate was revised and increased several times at later periods to take account of expenditures for repairs and for work done not included in previous estimates, and the estimate of final cost, according to the revision of 1889, is $1,424,435.

The dikes as built are in general pile dikes, single or double, and are revetted or filled with broken stone.

The total amount appropriated since 1864 is $1,279,330.57, and the amount expended to June 30, 1891, is $1,162,011.70.

The estimated amount required to be appropriated to complete the existing project is $145,000. It therefore appears that new estimates are essential at this time, in order that the improvement of the river may continue without interruption.

The following is a description of the plan now in process of execution:

First.—A system of longitudinal dikes to confine the current sufficiently to allow the ebb and flow of the tidal current to keep the channel clear; these dikes to be gradually brought nearer together from New Baltimore towards Troy, so as to assist the entrance of the flood current and increase its height, their height to be kept approximately at the level of the tidal high water, so as not to confine the freshets, the exact level, however, being left to be determined by experience as the work progresses.

Second.—That the dredge be used, so far as necessary, to open the channels above described, which the current should not be allowed to do, except very gradually, lest accumulations dangerous to navigation be formed below.

Third.—Keeping, as far as practicable, the side reservoirs open to the passage of tidal currents by gaps at their lower extremities, in order to increase the tidal flow.

Fourth.—Dumping all dredged material in secure places, where it can not be moved back again into the channel by the current.

Fifth.—Constructing the dikes of timber and stone, in a manner to secure their permanency, at a minimum cost, the details varying with the locality, to be left to the discretion of the local engineer, to be so designed as to admit of having an increased height given to the dikes if necessary.

Sixth.—To protect, when necessary, the banks and islands against the abrading action of the currents by revetments.

Seventh.—That limits, beyond which no encroachments upon the channels should be made, be prescribed, and that any such encroachments be reported to the engineer in charge.

The width between the projected dikes built to revet the banks as well as to contract the waterway varies from the minimum of 575 feet at Troy to the maximum of 1,200 feet at New Baltimore. The average width between Albany and New Baltimore is 800 feet, approximately.

During the time the improvement has been in progress certain facts in regard to the physics of the river have been gathered by the officers in local charge, which have been reported from time to time in annual reports to the Chief of Engineers, and in special reports by the assistants to the officer in charge, which form part of the files of the main office.

So far as practicable, the records have been carefully searched for this important information, and supplementary examinations have been made upon the river itself since the passage of the river and harbor act of September 19, 1890, especially by borings to determine the nature of the river bottom from the city of Hudson to the State Dam at Troy.

The general features of the river basins, and the special characteristics of the main river obtained from these sources, will now be stated before submitting the projects and estimates required of the Board to comply with the first part of its instructions.

PHYSICS OF THE HUDSON RIVER.

Drainage areas.—The Hudson River has its source in fourteen small lakes in the Adirondack Mountains of northern New York, near Newcomb, Essex County, which are 200 feet above tide water and have an aggregate water area of 6,000 acres. The length of the river from the sources to Fort Edward is 109 miles, and the drainage area to that point is 2,300 square miles. The distance from Fort Edward to the State Dam at Troy is 40 miles, and the difference of level between them is 108½ feet. The height of the dam being 9½ feet, the total difference of level between Fort Edward and tide water is 118 feet.

There is no river slope in the upper section corresponding to the actual fall, for the river is crossed by frequent dams, and is made up of a succession of reaches of different levels.

The drainage area of the lower section, below Fort Edward, is 2,075 square miles, making the total drainage area of the river above the State Dam at Troy, exclusive of the Mohawk Valley, 4,375 square miles, or 2,800,000 acres.

The Mohawk rises in the northwestern part of the State, and after flowing eastward for a distance of 150 miles joins the Hudson at Troy by several mouths. It drains an area of 2,800 square miles, or 1,814,000 acres, so that the total drainage area of the Hudson River to Troy is 7,200 square miles, or 4,614,000 acres.

The greater part of the material carried in suspension in the Hudson River above Albany is believed to come from the Mohawk River and its

tributary, the Schoharie River, while the sands and gravel that form the heavy and obstinate bars near Albany, and chiefly between Albany and Troy, have come from the Upper Hudson. Since the construction of the State Dam at Troy it is probable that the shoal bars above Albany are derived principally from the degradation of the banks of the river at all points, due to current action during freshets and to wash of waves created by passing steamers.

Rainfall and water supply.—The average rainfall during the past sixty-three years, from observations recorded in the report of the water commissioner at Troy for 1889, is 36.55 inches. The greatest rainfall in any year was in 1878, when the record was 49.23 inches; and the least rainfall in 1839, when the record was 18.32 inches.

The greatest rainfall in any one month was 13.8 inches, recorded in October, 1869, and the least rainfall, 0.2 inch, recorded in May, 1840.

Generally speaking, the effects of rain storms are shown by a rise in the river within twenty-four hours after the first rainfall.

At times during the dry season of nearly every year no water flows over the State Dam at Troy for a month at least, and, excepting the lockage water of the canals and the leakage through gates, there is during that period little apparent fresh-water supply from the upper river to the flow of the river below.

From this, and from the fact that the tide has a range of 1 foot, approximately, at the State Dam, it is evident that the navigation of the Hudson River below the dam is dependent in a large degree, at the low stage, upon tidal flow.

Freshets.—Freshets in the Mohawk River are severe, but of short duration, and are more frequent than in the Hudson.

The height of the greatest known freshet in the Hudson River, due to rainfall alone, above the plane of mean low water at Albany, where the width between banks is 850 to 1,000 feet, occurred in October, 1869, when the rise was 19 feet, due to a rainfall in that month of 13.8 inches.

The highest known rise, of 22 feet, at Albany, occurring in February, 1857, was due to an ice gorge at Van Wies Point, and it is to be remarked that during the same month the rise at Fort Edward was 18 feet, at Waterford 15 feet, and at the State Dam, Troy, 13 feet.

At Albany the heights of the spring freshets generally range from 6 feet to 8 feet above ordinary water level, but occasionally the waters rise 5 to 6 feet higher when the river opens rapidly, or when ice jams have been formed in front of or immediately below the city.

If the change from winter to spring is rapid, the freshets are violent but of short duration; but if the change is gradual, the river swells slowly, and slowly subsides, and the waters remain high through the spring and well into the summer.

In midwinter there is usually a period of mild weather called the "January thaw," during which there frequently occurs a partial rise in the river, soon checked by a return of cold weather. It is then that ice dams are usually formed, which last until the spring opens.

The greatest rises may be expected after severe rains in the spring, when the ground is frozen and the drainage free, or in the autumn.

The effect of the freshets is to produce unusual scour in contracted channels and on soft bottoms, and to deposit the abraded materials at the points where the cross section becomes enlarged.

The project of 1834 proposed to utilize the agency of freshets in opening a channel across the bars for the maintenance of the navigable water way by making the dikes high, but later projects for the improvement of the river are based upon the principle that freshets are detri-

mental as well as beneficial to the river, for the reason that they create irregularities in the regimen and bring about irregular scours and deposits, and in accordance with this principle the dikes provided for in the project for improvement adopted in 1867 do not rise above the plane of tidal high water.

The greatest velocity of flow corresponds to the highest rise of water only when the river is unobstructed.

Tides and discharges.—The tidal information in possession of the Board comes from observations made prior to 1890.

The tidal observations made in the upper river in 1876, corrected in 1884, are represented in the following table:

The mean rise and fall of tides at—

	Feet.
State Dam, Troy, N. Y	0.80
Nail Works, Troy, N. Y	1.94
Albany, N. Y	2.32
Castleton, N. Y	2.53
New Baltimore, N. Y	3.42
New York, Governors Island, from Coast Survey	4.40

The mean duration of rise of tides at Albany is five hours, and the mean duration of fall seven hours and twenty-five minutes.

The plane of mean low water at New York below that at—

	Feet.
New Baltimore	3.55
Castleton	4.35
Albany	4.78
Troy Nail Works	5.32
Troy State Dam	6.88

The State Dam at Troy is the dividing line between the tidal and nontidal compartments of the river system. When there is little or no water passing over the dam at or near low stage, the lower river becomes largely tidal for a period not exceeding six weeks, and the alternating flood and ebb currents there are well defined in their proper direction. When the upper rivers discharge their average supply, the ebb current is well defined, but the flood currents can scarcely be noticed. In times of freshets tides are still to be observed, but there is no appreciable flood current in the upper river. The times of high and low water stands, corresponding to two successive tidal waves, are coincident at Governors Island and at the State Dam, Troy, N. Y. At Tivoli, the tidal phases are the converse of those at Governors Island and at the dam.

The tidal area from the dam to Albany measures 47,600,000 square feet, and the corresponding tidal prism for a mean rise of 1.68 feet over the whole area measures 79,968,000 cubic feet.

The area of the cross section at Albany, where the width between protected banks is 850 feet, approximately, is 10,000 square feet at mean low water, and the mean discharge at that time is 2,995 cubic feet, approximately, per second. Gaugings of the Mohawk and Upper Hudson rivers above the dam were made in October, 1874, and the mean fresh-water discharge for the combined rivers for that month was found to be 4,853 cubic feet per second.

The calculated mean discharge above the dam for that month, based on the monthly rainfall of 1.77 inches (one-half the average monthly fall for the year), and an assumed drainage of 0.48 inch, was 3,001.6 cubic feet per second. It is probable that the gaugings were made shortly after a rainfall when the river was slightly in freshet, and the resulting mean discharge for that month is somewhat large. But assuming the gaugings to be correct, the error will be slight if the mean fresh-water

discharge for that month at Albany be taken at 5,000 cubic feet per second.

The calculated mean discharge of fresh water in 1874, at the Albany cross-section, based on the mean monthly rainfall for the entire year of 3.16 inches, and the assumed drainage of 1.67 inches, is found to be 10,703 cubic feet per second.

The information in regard to velocities at different stages is not conclusive, but observations show that moderate rises of 1 foot or more at Albany give surface velocities varying, during ebb, from 1 foot per second in the first quarter, to 2 feet in the last quarter. A freshet rise of 7 feet gives a velocity of 3 feet per second, and an 8-foot rise gives a velocity of 3¼ feet per second. It is reported also that the maximum rise does not give a velocity exceeding 6 feet per second.

The discharge of the Hudson between Troy and Albany at its lowest stage may be taken without great error at about 3,000 cubic feet per second. The river supply therefore during that stage is inadequate in the upper part of the river for scouring or for navigation, independent of tidal flow.

BARS.

The accompanying chart of the Hudson River, prepared from the latest surveys, shows in detail the location of all the obstructive bars from Troy to Hudson.

The channel from Broadway, Troy, north to the State dam, is contracted by numerous islands, and is very narrow and shoal. The water here flows over a rocky bed, restricting commerce principally to the wharves which lie south of Broadway.

From Troy to Albany, while the maximum depth of 14 feet, mean low water, is noted in many places, the navigable depth is reduced to 7½ feet to 8 feet, mean low water, by six obstructing bars composed of coarse and fine gravel and coarse and fine sand. Several of the deep pools, between the bars, particularly at Troy, and opposite Breakers Island, have groups of large bowlders covering the bed.

The navigable depth in this reach before improvements were made was about 4 feet, mean low water.

At Albany the average depth is 11 feet to 12½ feet, mean low water, but the maximum depth is 16 feet, approximately.

From Albany to New Baltimore the depths are very variable, the prevailing depth being 10 feet and over, with pools of greater depth separated by long cross-over bars, over which the greatest depth does not exceed 9 to 10 feet. These bars are eight in number and are composed chiefly of fine sand. In this reach rock outcrops above the plane of 22 feet, mean low water, at the Overslaugh, Van Wies Point, and at Mulls, and before improvement the approximate navigable depth was only 7 feet, mean low water.

New Baltimore is the highest point on the river at which the depth of 20 feet, mean low water, is found, and from that place south to Hudson two points are observed where there is a less depth than 15 feet; one point is at Stonehouse Bar, where the least depth is 13 feet, mean low water, and the other at Four Mile Point, where the least depth is 14 feet, mean low water. These are bars of fine sand, and their formation has been the result of long action, though it is to be remarked that the shoaling at Stonehouse Bar has been more rapid of late years than formerly, owing possibly to the fact that the construction of contracting dikes above New Baltimore has induced an increased downstream movement of detritus to form bars in the spaces below New Baltimore, where the stream has not been confined by artificial works.

BORINGS.

To ascertain the character of the formation underlying the bed of the river essential to the preparation of estimates for excavations extending to a plane 22 feet below mean low water, borings were taken along cross sections 1,000 feet apart from Troy to New Baltimore, and also at different points in the vicinity of Hudson, the results of which are shown upon the accompanying chart.

It suffices to say in regard to these results that rock was developed at a depth of from 7 feet to 17 feet below mean low water from the State dam at Troy to Breakers Island, a distance of 3½ miles. Thence for a distance of 8 miles to the Overslaugh Rock no rock was found above the depth of 22 feet. From the Overslaugh Rock to Staats, a distance of 1½ miles, rock outcrops in a few places above the plane of 22 feet, mean low water. From Staats to Mulls, a distance of 5 miles, no rock occurs except in small quantity at Cedar Hill Bar, lying west of the channel. Between Mulls Cross-Over and Hudson no rock was found except at Matthews Point, just below New Baltimore, where a narrow reef running from bank to bank and rising to 13.6 feet below low water was developed.

ADDITIONAL REGULATION OF THE RIVER.

It has already been stated that existing artificial works for regulating the river terminate at New Baltimore. These works, in part, have been in operation now for nearly twenty-five years, and while the depths in the channel embraced between the revetted banks have gradually and continuously increased to the advantage of the navigation of the river, there are evidences that at at least one bar below New Baltimore, viz, Stonehouse Bar, some deterioration by shoaling is going on, which must be provided for by the downward extension of the artificial works, even if no enlargement of present projects for improvement is authorized.

The Board has studied the reach of the river from New Baltimore to Coxsackie with some degree of care, and has estimated approximately for a system of new works on both banks designed to regulate this reach as well as to protect the banks of the river and of intervening islands against degradation by currents and wave action. The precise character of the proposed works, their extent, and their true location, are left to the determination of the local officer when the new project for improvement is adopted, and when funds for construction become available by future appropriations.

The Board will state generally that the main channel should be carried over Stonehouse Bar, and the secondary channel behind Bronks Island should be closed, by building a dike from a convenient point in South New Baltimore along the eastern margin of the shoal at the head of Bronks Island, and continued along that island as far as may be decided necessary; that the unprotected and exposed heads and shores of Bronks, Light House, and Coxsackie islands should be revetted so as to protect them against abrasion, leaving the channels behind the two latter islands open for commercial uses, and that the eastern shore of the river from Stuyvesant Light to Nutten Hook should be revetted in a suitable way for the better maintenance of the channel. The Board also thinks that the shoal forming at the lower end of Coxsackie Island should be removed and that the river should be given a cross section at that point not less in area than that at Coxsackie Landing, immediately below.

The aggregate length of shore line for which protection is recommended is about 40,000 linear feet, and the estimated cost of the proposed works is $350,000, approximately.

The estimated cost of these constructions, which are included in the estimates required of the Board, are necessarily only approximate, as the absolute cost can only be determined after more detailed studies have been given to the subject by the local officer.

The Board further thinks that increased depths where needed below Coxsackie can be more quickly and economically obtained by the usual method of dredging than by a resort to permanent works of improvement.

ESTIMATES OF COST.

The act of September 19, 1890, under which this report is submitted, calls for three distinct projects of improvement, two of which provide for a channel navigable for vessels drawing 20 feet, and one for a depth of 12 feet at mean low stage of the river. The Board now presents separate estimates for these projects:

1. ESTIMATE OF COST OF WIDENING AND DEEPENING THE HUDSON RIVER BETWEEN NEW YORK AND ALBANY, FOR THE NAVIGATION OF SEAGOING VESSELS DRAWING 20 FEET OF WATER, AFFORDING A CHANNEL 400 FEET WIDE AND 21 FEET DEEP, MEAN LOW WATER, WITH SIDE SLOPES OF ONE ON ONE IN ROCK, ONE ON THREE IN SAND.

a. From Hudson City to New Baltimore (Hudson Channel).

1. Priming Hook Shoal, dredging	cubic yards..	399,925	
2. Four Mile Point Shoal, dredging	do....	1,583,452	
3. Coxsackie Shoal, dredging	do....	855,861	
4. Bronks Island Shoal, dredging	do....	535,287	
5. Stone House Bar, dredging	do....	983,903	
Total dredging	do....	4,358,428	
Amounting, at 20 cents per cubic yard, to			$871,685.60
6. Reef at Matthews Point, removing 17,482 cubic yards rock, at $10 per cubic yard			174,820.00
			1,046,505.60

b. From New Baltimore to Albany.

1. Willow Island Shoal, dredging	cubic yards..	1,636,616	
2. Coeymans Shoal, dredging	do....	1,006,231	
3. Mulls Cross-Over, dredging	do....	2,969,119	
4. Cedar Hill Bar, dredging	do....	1,610,615	
5. Winnies Bar, dredging	do....	956,207	
6. Van Wies Shoal, dredging	do....	1,554,592	
7. Bogart Light Shoal, dredging	do....	1,794,398	
8. Cuylers Bar, dredging	do....	1,859,874	
Total dredging	do....	13,387,652	
Amounting, at 20 cents per cubic yard, to			2,677,530.40
9. Mulls Cross-Over, rock removal	cubic yards..	46,570	
10. Cedar Hill Bar, rock removal	do....	9,216	
11. Overslaugh, rock removal	do....	76,342	
Total rock removal	do....	132,128	
Amounting, at $10 per cubic yard, to			1,321,280.00
Additional regulation work			350,000.00
			5,395,316.00
Contingencies, 10 per cent			539,531.60
Total			5,934,847.60

2. ESTIMATE OF COST OF WIDENING AND DEEPENING THE HUDSON RIVER BETWEEN NEW YORK CITY AND THE STATE DAM AT TROY, FOR THE NAVIGATION OF SEA-GOING VESSELS DRAWING 20 FEET OF WATER, AFFORDING A CHANNEL 400 FEET WIDE AND 22 FEET DEEP, MEAN LOW WATER, TO THE FOOT OF BROADWAY, TROY, AND THENCE TO THE DAM AT TROY, 200 FEET WIDE AND 22 FEET DEEP, MEAN LOW WATER, INCLUDING THE FORMATION OF A BASIN BELOW THE DAM.

a. From Hudson City to Albany.

Same as in first estimate, above		$5,395,316.00

b. From Albany to State Dam at Troy.

1. Kellogg Shoal, dredging	cubic yards..	1,909,285	
2. Fish House Shoal, dredging	do....	1,421,498	
3. Round Shoal and Covills Folly, dredging	do....	1,866,965	
4. Van Burens Bar, dredging	do....	971,808	
5. Washington Bar, dredging	do....	745,208	
6. Washington Bar to foot of Broadway, dredging	do....	494,158	
7. From foot of Broadway to State Dam, dredging	do....	531,465	
Total dredging	do....	7,940,387	
Amounting, at 20 cents per cubic yard, to			1,588,077.40
8. Breakers Island, rock removal	cubic yards..	140,924	
9. Arsenal, rock removal	do....	510,092	
10. Troy to State Dam, rock removal	do....	424,084	
Total rock removal	do....	1,075,100	
Amounting, at $10 per cubic yard, to			10,751,000.00
			17,734,393.40
Contingencies, 10 per cent			1,773,439.34
Total			19,507,832.74

3. ESTIMATE OF COST OF IMPROVING THE HUDSON RIVER BETWEEN COXSACKIE AND THE STATE DAM AT TROY TO SUCH AN EXTENT AS TO SECURE A NAVIGABLE CHANNEL 12 FEET DEEP AT MEAN LOW WATER, THE CHANNEL TO BE 400 FEET WIDE FROM COXSACKIE TO FOOT OF BROADWAY, TROY, AND 300 FEET WIDE FROM FOOT OF BROADWAY TO STATE DAM AT TROY, THE SIDE SLOPES IN ROCK TO BE ONE ON ONE, AND IN SAND ONE ON THREE.

a. From Coxsackie to Albany.

1. Coxsackie Shoal, dredging	cubic yards..	106,072	
2. Stone House Bar, dredging	do....	58,323	
3. Willow Island Bar, dredging	do....	275,089	
4. Coeymans Shoal, dredging	do....	60,842	
5. Mulls Cross-Over, dredging	do....	367,104	
6. Cedar Hill Bar, dredging	do....	112,800	
7. Winnies Bar, dredging	do....	85,938	
8. Van Wies Shoal, dredging	do....	223,362	
9. Bogart Light Shoal, dredging	do....	342,048	
10. Cuylers Bar, dredging	do....	271,669	
Total dredging	do....	1,903,247	
Amounting, at 20 cents per cubic yard, to			$380,649.40
11. Overslaugh, removing 1,495 cubic yards rock, at $10 per cubic yard			14,950.00
			395,599.40

b. From Albany to State Dam.

1. Kellogg Shoal, dredging	cubic yards..	387,688	
2. Fish House Shoal, dredging	do....	484,126	
3. Round Shoal and Covills Folly, dredging	do....	602,278	
4. Van Burens Bar, dredging	do....	288,829	
5. Washington Bar, dredging	do....	356,350	
6. Washington Bar to foot of Broadway, dredging	do....	87,988	
7. Foot of Broadway to State Dam, dredging	do....	509,542	
Total dredging	do....	2,716,801	
Amounting, at 20 cents per cubic yard, to			543,360.20

8. Breakers Island, rock removal.....cubic yards..	8,942	
9. Arsenal, rock removal.....do....	2,824	
10. Foot of Broadway to State Dam, rock removal ...do....	81,875	
Total rock removal.....do....	93,641	
Amounting, at $10 per cubic yard, to		$936,410.00
Additional regulation work		350,000.00
		2,225,369.60
Contingencies, 10 per cent		222,536.96
Total		2,447,906.56

RECAPITULATION.

No. 1. For channel 22 feet deep and 400 feet wide from New York City to Albany.

From Hudson City to Albany:	
Dredging 17,746,080 cubic yards, at 20 cents	$3,549,216.00
Removing 149,610 cubic yards rock, at $10	1,496,100.00
Additional regulation work	350,000.00
	5,395,316.00
Contingencies, 10 per cent	539,531.60
Total	5,934,847.60

No. 2. For channel 22 feet deep and 400 feet wide from New York City to foot of Broadway, Troy, and thence 22 feet deep and 200 feet wide to State Dam at Troy.

From Hudson to State Dam at Troy:	
Dredging 25,686,467 cubic yards, at 20 cents	$5,137,293.40
Removing 1,224,710 cubic yards rock, at $10	12,247,100.00
Additional regulation work	350,000.00
	17,734,393.40
Contingencies, 10 per cent	1,773,439.34
Total	19,507,832.74

No. 3. For channel 12 feet deep and 400 feet wide from Coxsackie to foot of Broadway, Troy, and thence 12 feet deep and 300 feet wide to State Dam at Troy.

From Coxsackie to State Dam:	
Dredging 4,620,048 cubic yards, at 20 cents.	$924,009.60
Removing 95,136 cubic yards rock, at $10	951,360.00
Additional regulation work	350,000.00
	2,225,369.60
Contingencies, 10 per cent	222,536.96
Total	2,447,906.56

Having presented the projects and estimates of cost for widening and deepening the river, as required by the act under the provisions of which this report is submitted, the Board now passes to the consideration of the second part of its instructions, which requires a statement as to the usefulness of such improvements and of their relations and value to commerce, and of the advisability of entering upon the same at this time. This subdivision of the subject relates directly to the character and extent of the present commerce of the river and the means by which it is transported, to possible modifications of that commerce in the future, and to the expediency of now enlarging the widths and depths of the existing channels to facilitate and maintain the present commerce and to encourage and provide for its future development.

The Hudson River is an arm of the sea extending inland for 150 miles. For 100 miles from its mouth the channel is adequately wide and deep for the largest vessels, but beyond to the head of navigation it is narrow, crooked, and obstructed by shoals and rocks.

The present relations of the river to commerce are of a twofold character. First, it carries a very large local traffic, larger indeed than that of any other river in the United States; and secondly, it forms an important part of a great system of waterways extending through the northern lakes to the sea. It is impossible to divide the commerce of the river into classes corresponding with any degree of accuracy to these two relations; but it will be sufficient for the purposes of this report to consider as *local* traffic the movement of all materials which do not come to the river through the State canals, and as *through* traffic the movement of all materials which come through the canals and are principally carried down the river to the sea, where they are in part shipped to foreign ports.

Considering simply the tonnage transported, the local traffic of the river is by far the more important, and accordingly attention is first invited to this branch of the subject.

The latest reliable information concerning the commerce of the Hudson River is contained in the Annual Report of the Chief of Engineers for 1890, the statistics of which were collected and tabulated with great care and thoroughness. It appears from this report that some of the principal sources of the local commerce of the Hudson are as follows:

The Delaware and Hudson Canal, which enters the river at Rondout, N. Y., connects the Hudson with the anthracite coal region at Honesville and the Delaware River. The principal items of tonnage on this canal are coal, bluestone, and cement. The Pennsylvania Coal Company has a large tide-water coal depot at Newburg, where also the Erie Railroad transfers large quantities of freight by boat across the river. The Erie Railroad has a coal depot at Piermont, 20 miles above New York, where a large supply is to be handled.

The two principal industries of the river which materially increase the total tonnage are ice and brick. The amount of ice annually harvested generally exceeds 3,500,000 tons and the number of bricks manufactured 850,000,000.

The total tonnage of all shipping points on the river during 1890, exclusive of the tonnage transported through the State canals—that is, the tonnage corresponding to the local traffic—was 15,033,309 tons. It was nearly three times the tonnage of the through traffic.

In addition to this enormous commerce, the passenger traffic should be mentioned. In 1890 there were thirty transportation companies for passengers or freight, not including individual steamboats or pleasure boats. The total number of passengers carried was about 5,000,000.

But although the volume of the local traffic so greatly exceeds that of the through traffic, the commercial relations of the river considered as a part of the great system of northern and western water transportation are, from a national point of view, by far the more interesting and important.

The commerce derived from remote sources through connecting artificial water ways, or which may be so derived by future works, is a branch of the subject which was strongly emphasized by the unexpected direction which the discussions took at the public hearings, and the Board desires to give it as liberal consideration as its instructions permit.

The Northwest is now, and will continue to be in the future, the great

food-producing region for the States along the coast and for a part of Europe. The map shows at a glance the vast extent of the territory tributary to the Great Lakes, the products of which can be delivered at the lake ports and thence shipped to Lake Erie or Lake Ontario, whence they can be carried by various land and water routes to the sea. From the head of Lake Superior at Duluth, the line of water transportation extends through Lake Superior and the St. Marys Falls Canal into Lake Huron, where it joins the lines from Chicago and Milwaukee through Lake Michigan; it passes through Lake Huron, the St. Clair Flats Canal, and the Detroit River into Lake Erie and through the Welland Canal into Lake Ontario. The capacity of this route for navigation is determined by the minimum depths along it, which are at the lake ports, the St. Marys Falls Canal, the St. Clair Flats Canal and Detroit River, and the Welland Canal. The lake ports, St. Marys Falls Canal, St. Clair Flats Canal, and Detroit River carry at present a minimum depth of 16 feet; but the projects for improvement now in progress contemplate in all these localities a depth of 20 feet, which will doubtless be secured in the near future. The Welland Canal, which is in foreign territory, carries a depth of 14 feet.

In addition to the enormous volume of transportation along this route large quantities of grain, lumber, and ore are shipped from territory in the vicinity of Lakes Ontario and Champlain.

The importance of the Hudson River in its relations to these great routes of water transportation lies in the fact that it forms a part of all but one of the lines connecting Lakes Erie, Ontario, and Champlain with the sea; and the location and character of these connecting lines, as well as the relative volumes of the commerce passing over them, must be briefly considered in order to obtain a definite idea of the value of the river to commerce.

The routes referred to are as follows:

1. *The Erie Canal route.*—The Erie Canal connects Lake Erie at Buffalo with the Hudson River at Troy and Albany, a distance of about 352 miles. It has 71 lift and 2 guard locks. It has a depth of 7 feet over miter sills. The capacity of the locks is now being enlarged, but the depth is not being increased. The total distance from Lake Erie to the sea by this route is about 482 miles, and to Liverpool about 3,922 miles.

2. *The St. Lawrence route.*—This route connects Lake Erie with tide water at Montreal, on the St. Lawrence, as follows: From Lake Erie to Lake Ontario by the Welland Canal, thence through Lake Ontario to the head of the St. Lawrence River, and thence by the river and the five canals around its shallows to Montreal. This route has 53 locks, and the distance from Lake Erie to Montreal is about 375 miles. The distance from Lake Erie to Liverpool is about 3,220 miles. The minimum depth is now 9 feet in the St. Lawrence canals, but an increase to 14 feet depth is in progress.

3. *The Oswego Canal route.*—This route connects Lake Ontario at Oswego with the Hudson River at Troy and Albany as follows: By the Oswego Canal from Oswego to the Oneida River; thence by the canal to Syracuse and also by the Oneida River, lake, and canal to Durhamville, and from Syracuse or Durhamville by the Erie Canal to Troy and Albany. The length of the route is about 208 miles. It has 67 locks and a depth of about 7 feet.

4. *The Champlain Canal route.*—This route connects Montreal with the Hudson River as follows: From the St. Lawrence River, 45 miles below Montreal, to Lake Champlain by the Chambly Canal; thence through the Champlain Canal to Waterford, 3 miles above the State

dam, and thence by lock to tide water on the Hudson at Troy, or by Erie Canal to Albany. This route has 30 locks. The minimum depth is 7 feet, and the distance from Montreal to Albany 311 miles.

The Board has not attempted a complete analysis of the commerce transported over these routes to the sea, the information available not being sufficient for this purpose, but the following statistics, compiled from the reports of the Census Bureau, the Canadian Department of Railways and Canals, and the Chief of Engineers, U. S. Army, and from other authentic sources, will give a general idea of the volumes of traffic over the different lines:

During the year ending June 30, 1890, the total quantity of freight passing through the Detroit River was nearly 20,000,000 tons. The amount passing through the New York State canals was 5,246,102 tons, of which the Oswego Canal carried 225,936 tons, the Champlain Canal 1,520,757 tons, and the Erie Canal 3,499,409 tons. The amount passing through the Welland Canal during the season of navigation in 1890 was 978,692 tons, of which 263,697 tons were transported by water to and from Montreal, and 533,957 tons were moved between the ports of the United States. The total quantity of freight coming to and leaving the Hudson River through the State canals was 3,592,437 tons.

A great portion of the material thus transported finds a market in our own country and would not, under any circumstances, be carried in seagoing ships. A study of the statistics of the eastward movement of grain along the different routes may perhaps serve to indicate more clearly their relative importance in connection with the export commerce of the country.

During the season of 1890 the quantity of grain carried to tide water by the New York State canals was 1,131,298 tons, and by the New York State railways, 3,045,302 tons. The quantity carried to Montreal through the St. Lawrence canals was 242,571 tons, and by rail, 119,208 tons. The total quantity transported over these routes was 4,583,390 tons. It thus appears that about seven-tenths of the whole quantity moved was carried over the railways and about three-tenths over the water ways. Less than one-tenth was moved over Canadian routes.

The figures given in the above statements will serve to indicate in a general way the great extent and value of the commerce of the Hudson River. There is no river in the United States, except the Detroit and St. Clair rivers, comparable with the Hudson River for the extent, variety, and value of its commerce, the number of its transportation companies, the number and variety of its steam and sailing vessels and barges, and the number of passengers transported; and the relations of the river to the lake navigation are peculiarly interesting and significant. In this connection attention is invited to the able papers in the appendix read before the Board by Hon. James H. Manning, mayor of Albany; Mr. S. A. Thompson, secretary of the Duluth Chamber of Commerce; Hon. Vreeland H. Youngman, Albany Chamber of Commerce; Hon. H. C. Burleigh, of Whitehall; Hon. Martin I. Townsend, of Troy, and others, to all of which the Board has given the most careful consideration.

In discussing the question of the expediency of now enlarging the widths and depths of the existing channels, it appears desirable for the sake of clearness to examine the subject in two parts; first, in relation to existing commercial conditions, and secondly, with reference to the probable future development of commerce. Under these heads, therefore, the Board proposes to investigate, first, the usefulness of improv-

ing the channel to a depth of 12 feet at mean low water, and secondly, the expediency of its enlargement to greater depths.

This arrangement, although it does not conform to the order indicated in the act, seems the more satisfactory; for, as will appear in the sequel, the enlargement of the channel to a depth of 12 feet need not necessarily be considered as the full completion of the improvement, but may be regarded as merely the commencement of a more extended project to be executed when found desirable in the future.

The Board now proceeds to consider the usefulness of improving the channel of the river to a depth of 12 feet at mean low water, between Coxsackie and the State Dam at Troy, under the conditions of commerce existing at the present time. Such an improvement would evidently be of no benefit to the through traffic, for none of the water lines connecting the Hudson with the lakes have a greater depth than 7 feet. The present river depths are ample for vessels passing over these connecting lines, and the increase of river depth proposed would not be sufficient for the navigation of ocean-going freight vessels.

As regards the local traffic, however, the conditions are entirely different. The study of the commercial history of the river for a number of years past impresses the Board with the conviction that the existing project for improvement, adopted in 1867, which provides for a navigable depth of 11 feet, mean low water, only to Albany, and of 9 feet to Troy, does not give adequate facilities for the large commerce transported upon the river. These depths barely exceed the draft of the largest vessels which navigate the river to the points named, and when from any cause new bars are formed, or old ones are enlarged or extended, the injuries suffered by commerce at extreme low stages through detentions in various ways at the shoal obstructions are serious and oppressive. In view of the necessities of the commerce incident to the river proper and its tributary country, the Board is of the opinion that the project for improvement adopted in 1867 should be extended so as to provide for a channel depth of at least 12 feet at mean low water, and that such an extension is well worth the expenditure required for its execution.

The proposed projects for the improvement of the river channel up to Albany, and also up to the State Dam at Troy, for the navigation of seagoing vessels drawing 20 feet of water (that is, to a depth of at least 22 feet), bear relations to existing commercial conditions very different from the 12-foot project above considered. As regards the *local traffic* it is probable that it will not under any circumstances be conducted in vessels of 20 feet draft, and a channel of 22 feet depth would be of but little more practical benefit to that traffic than the 12-foot channel above referred to. It is therefore with reference to the *through traffic* alone that the Board thinks this project for a channel of 22 feet depth worthy of careful investigation. The arguments in favor of such an improvement were fully and ably presented to the Board at its two public meetings held at Albany and at New York. These arguments, so far as they relate to existing commercial conditions, may be briefly summarized as follows:

By the construction of a deep-water channel to Albany and Troy the ocean will be directly joined to the canals. Vessels navigating the canals can then discharge their cargoes at Albany and Troy, avoiding the expense and delay of going down the river to New York, and thus the carrying capacity of the canals will be increased. The difference in cost of transportation to New York would be saved. It is argued that, owing to the expense and delay arising from the lack of terminal

facilities at New York, seagoing vessels would prefer to take their cargoes at Troy and Albany were the channels of sufficient dimensions for their navigation. A large quantity of lumber, now generally shipped in bond by rail from Ottawa, Canada, to Boston for export, could, if the channels were deepened, be sent by rail to Albany and thence shipped direct to South American and other foreign ports with a considerable reduction in expense. Finally, attention was invited to the importance of a deep-water channel in case of war, so that our vessels could go directly to the Watervliet Arsenal for military supplies.

The Board has given these arguments careful consideration, and begs to submit the following remarks in relation thereto: While it is doubtless true that the traffic of the Hudson River would be materially increased if seagoing vessels could and would go to Albany or Troy to take their cargoes, it is believed that such increase would be principally if not wholly derived from materials brought to the shipping points by rail, such as the lumber from Canada referred to above. The carrying capacities of the canals are determined principally by the number of boats which can be passed daily through their locks, and these capacities can be increased only by improvements in their lockage facilities. Such improvements are now in progress on the Erie and Oswego canals, but they do not provide for any increase of depths. The Board is of the opinion that the volume of through traffic on the canals can not be sensibly increased by the construction of a deep-water river channel so long as the navigable depths of the canals remain unimproved.

But the Board considers it doubtful if any considerable number of seagoing vessels would go to Albany or Troy to receive cargoes even if a deep-water channel existed. If, as has been stated, the terminal facilities at New York are inadequate and unsatisfactory, they can and doubtless will be improved at points nearer than Albany and Troy, for there is no lack of natural advantages in the harbor and its immediate vicinity.

New York is the center of a vast population, and the point from which by far the greater proportion of incoming commerce is and must always be distributed. Seagoing vessels receiving their cargoes at Troy or Albany would, therefore, generally have to go to these points in ballast. Considering the delay, cost of pilotage, and other incidental expenses, the Board doubts whether any material saving in the cost of transportation would result. Wheat has been carried this summer from Chicago to New York for 5 cents per bushel, and the Board is not convinced that, under existing conditions, a sufficient reduction in cost of transportation would result from the deepening of the Hudson to produce an effect upon the relative quantities transported over the different routes which would justify the large expenditure involved. If the extension of the deep-water channel is desirable, why, it may be asked, is not the Hudson now navigated by seagoing vessels to the existing head of the deep-water channel at Athens or Hudson, 100 miles from New York? This question has been answered by the statement that at these points there are no facilities for distribution and no adequate connections with the great lines of through transportation. But it seems probable that such facilities and connections would soon be provided if they were urgently demanded by the necessities of commerce.

In this connection attention is invited to a communication from the committee on harbor and shipping of the New York Chamber of Commerce, submitted to the Board at its request, wherein the portion of commerce which may possibly be affected by the proposed improvement is presented. This paper will be found in the appendix.

The committee concludes that the improvement can not be of benefit to sailing vessels or steamers of the regular lines, and that advantage can be derived therefrom only by transient freight-seeking steamers with a loaded draft of 20 feet or less, during the brief period between harvest and the closing of the canals, and in spring from the opening of the canals until the movement of the crops ceases. The figures submitted by the committee indicate that the total exports from New York in 1890 were 6,258,222 tons, of which 4,829,775 tons were shipped by steamer. The tonnage brought to tide water from the canal system, much of which was distributed in the United States, was 3,024,765 tons. The exports derived from the canals, carried by the regular steamer lines, are estimated by the committee at 1,503,161 tons, and by the transient steamers 278,831 tons. The amount carried by transient steamers of a draft of 20 feet or less, which the committee considers could alone be benefited by the proposed improvement, is estimated at 75,390 tons.

If these statements be accepted it is reasonable to suppose, however, that in case improvements in depth are effected, a larger number of steamers conforming to the modified conditions would be provided, if these were made sufficient to invite them.

The Board does not feel called upon to express an opinion as regards the necessity of this improvement for military purposes, this branch of the subject not having been included in its instructions. The authorities in charge of matters relating to the national defense will doubtless determine whether it is desirable to locate our military establishments where adequate water communications now exist or improve the lines of water transportation to other points.

In view of the facts and reasons above set forth, the Board is of the opinion that the possible benefits to commerce to be derived from the proposed improvement for vessels drawing 20 feet are not under existing conditions sufficient to justify at this time the expenditure necessary to make such improvement.

But a very important branch of the subject still remains to be considered, viz, the relations of these improvements to the future development of commerce. It can not be doubted that this development will continue as rapidly as in the past, for the grain-producing area is continually extending towards the Northwest. The Board is fully impressed with the importance of these lines of water transportation in their relations to the large and rapidly increasing traffic from the lakes to the sea. The relative volumes carried by water and by rail have already been indicated; but even if improvements in the water routes should not increase the relative quantities transported over them, the Board is of the opinion that such improvements will be of the greatest benefit to commerce. The influence of these routes in the reduction and control of railway rates has a commercial value far greater than is indicated by the mere tonnage carried. It is also evident that as population increases and the development of the railway system approaches its profitable limit the relative importance of the lines of water transportation will be augmented, and the necessity for improving them to their utmost capacities will finally become imperative. A large portion of these lines is not under the control of the General Government, but the Board is of the opinion that the part which is under such control should always be fully developed to keep pace with the improvements made along the interior and connecting lines.

The attention of the Board has been invited to the fact that the Canadian Government is now engaged in the improvement of its water

route from the lakes to the sea, and soon will have established a route from Lake Erie through Lake Ontario and down the St. Lawrence River with a minimum depth of 14 feet. When this route is completed it is feared by the advocates of the improvement now under consideration that a considerable part of the commerce now traversing our own water ways will be diverted through a foreign country, unless the change is met by corresponding improvements in our own water routes. In this connection, however, it should be remarked that only about 8 per cent of the products of the Northwest finds its way to the sea for export. The grain product of the United States and Canada for 1890 is estimated at about 2,650,000,000 bushels, while the quantity of grain exported, including flour, during the same year was about 211,000,000 bushels, or less than one-twelfth (8 per cent of the total production). The market for by far the greater part of these products lies in our own country, south of the lakes and the St. Lawrence, and no improvement of water ways in Canada or elsewhere can greatly influence the general direction of its movement.

But although this danger of losing a part of our carrying trade has, perhaps, been somewhat magnified, it is still a real one; and accordingly various projects for the improvement of our water routes have been proposed and discussed. The most important of these—indeed, the only one which need be considered in connection with the proposed improvement of the Hudson—is the radical enlargement of the Erie Canal, so as to permit its navigation by the largest vessels now carrying the commerce of the Great Lakes. This project requires an increase of depth to at least 18 feet, a corresponding widening, and reconstruction of the entire lock system on a grand scale. The cost of the work involved has been variously estimated at from one hundred and fifty to two hundred and fifty millions of dollars. The Board begs to refer to a paper by Mr. E. Sweet, and the accompanying discussion by other distinguished engineers, published in the transactions of the American Society of Civil Engineers, February, 1885, in which this project is fully and most ably considered.

Should this proposed enlargement of the Erie Canal be effected, the Board is of the opinion that the full deepening of the Hudson River to 22 feet would become a necessity, but for reasons very different from those considered in connection with the conditions of commerce as they now exist. The object of the improvement would no longer be to bring seagoing vessels to Albany and Troy to receive their cargoes, but to enable vessels navigating the lakes to carry their cargoes clear through, not only to the coast but also to foreign ports, without rehandling them at any intermediate points.

In view of the vast commercial interests involved, such an improvement in the future can not be considered as beyond the limits of possibility; but the Board believes its commencement, or even its serious contemplation at the present time, to be highly improbable. The responsibility of the large expenditure required will not be assumed until it is settled beyond a doubt that commensurate benefits will be obtained; and this is a question with reference to which the views of experts are still at variance. The plans now in process of execution by the State of New York to increase the capacity of the canals do not contemplate the ultimate formation of channels for ships, but involve large expenditures which will be completely useless should a deep-water project be finally adopted.

The improvement of the several water routes from the lakes to New York City, on a much less extensive scale than that proposed at the

public hearing, received the consideration of Congress in 1874, and for information of the details of the improvement then proposed and the estimated cost, the Board invites attention to the report on the "Third Subdivision of the Northern Transportation Route," through northern and central New York, made to comply with the act of Congress approved June 24, 1874, and contained in the Annual Report of the Chief of Engineers for 1875, Part II, page 534.

Finally the Board invites attention to the interesting experiment now under trial of carrying unbroken cargoes through from Duluth to Liverpool in vessels of only 14 feet draft. On June 11, 1891, the *Charles W. Wetmore*, a steel vessel of the new "whaleback" type, left Duluth for Liverpool with a cargo of 70,418 bushels of wheat, this being the first clearance from Lake Superior for a foreign port. She passed through the lakes and Welland Canal, lightering a part of her cargo at Kingston and taking it on again with an additional load at Montreal, proceeded down the St. Lawrence to the sea, and finally arrived at Liverpool with 87,503 bushels of wheat on July 21, 1891. When the improvements now in progress on the Canadian canals are completed, it is said that such a vessel will be able to carry an unkroken cargo of nearly 3,000 tons from Lake Superior to a foreign port and return. The successful introduction of such vessels may possibly revolutionize the carrying trade of the Great Lakes, and render unnecessary the formation of channel depths so great as are now considered desirable in the lines of water transportation.

In view of the above considerations the Board is of the opinion that the present demands of commerce, and its probable development in the near future, do not now justify the expenditure of the amount of money necessary for the formation of the proposed channel for seagoing vessels drawing 20 feet of water from New York to Albany or to the State Dam at Troy.

CONCLUSIONS OF THE BOARD.

The Board, after thoroughly analyzing the duties imposed upon it by the act of September 19, 1890, now presents its conclusions with some degree of confidence that every legitimate interest submitted to its judgment has had its full share of consideration.

First.—The estimates of cost of carrying out the two projects contained in the said act, which provide for widening and deepening the channels between New York City and the city of Albany, and between New York City and the city of Troy, for the navigation of seagoing vessels drawing 20 feet of water, are $5,934,847.60 and $19,507,832.74, respectively.

The improvements to be effected by this large expenditure will, in the opinion of the Board, confer no important practical benefit upon commerce until the suggested artificial water connection, 350 miles long and of adequate depth, is made between the Hudson River and Lake Erie, through the State of New York, at an additional cost estimated as high as $150,000,000 to $250,000,000.

In view of the excessive cost of these several projects, singly or combined; of the improbability that either the State or the General Government will assume, at an early day, the responsibility of making such an artificial deep-water connection; and of the long period of time which must necessarily elapse before such a connection can be made between river and lake, even if such an undertaking were in progress to-day, the Board is of the opinion that it is not advisable at this time to enter upon the projects for deepening the Hudson River from the

outh to Albany, or to Troy, N. Y., for the navigation of sea-going ves-ls drawing 20 feet of water. What is practically the commencement such a project with a view to its ultimate complete execution in the ture, when the needs of commerce require it, is, however, considered esirable; but the Board is of the opinion that the improvement should ot be carried to the full depth of 22 feet at the present time.

Second.—After carefully studying the wants of commerce, the Board of the opinion that the third project contained in the act of Septem-er 19, 1890, which provides for improving the Hudson River "between oxsackie and the State Dam at Troy to such an extent as to secure a avigable channel 12 feet deep at mean low water," is a worthy and use-l one, and accordingly recommends it for adoption.

In the estimates submitted for this project, the Board has adopted a annel 400 feet wide to Troy, and thence 300 feet wide to State Dam at roy.

The Board recommends that the regulating works between Troy and ew Baltimore, provided for in the existing project, be maintained and at supplementary regulating works of a permanent character be pro-ded between New Baltimore and Coxsackie.

The Board describes in a general way only the supplementary works quired to be built, as it is expected that further study and investiga-on as the work of improvement progresses may lead the local officer recommend a modification of such works both as regards their loca-on and extent, as well as the exact dimensions which shall be given them.

In conclusion, in order that the good results which may be expected follow upon the completion of the recommended project may be alized at the earliest practicable moment, the Board further recom-ends that liberal appropriations, commensurate with the importance the work, be made annually, so that the desired improvement may completed within a period not exceeding five years.

The papers enumerated below accompany this report as appendices:

) Report of Mr. Charles G. Weir, assistant engineer, dated July 21, 1891, on bor-ings made along the bed of the Hudson by direction of the Board of Engi-neers.
) Stenographer's report of the public meeting held in Albany January 6, 1891.
) Stenographer's report of the public meeting held in New York May 15, 1891.
) Communication from the committee on harbor and shipping of the New York Chamber of Commerce.
) Letters and resolutions filed with the Board of Engineers by the secretary of the Chamber of Commerce, Albany, N. Y.

G. L. GILLESPIE,
Lieut. Col. of Engineers.
AMOS STICKNEY,
Major of Engineers.
C. W. RAYMOND,
Major of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

APPENDIXES.

APPENDIX 1.

REPORT OF MR. CHARLES G. WEIR, ASSISTANT ENGINEER, ON BORINGS ALONG HUDSON RIVER.

UNITED STATES ENGINEER OFFICE,
Albany, N. Y., July 21, 1891.

COLONEL: I have the honor to submit the following report on the examinations and borings in the Hudson River, between the State dam at Troy and the city of Hudson, made to determine the character and depth of deposits that would be encountered in excavating a channel for vessels drawing 20 feet of water, to comply with the river and harbor act of Congress of September 19, 1890.

This work was begun October 28, 1890, and continued until December 2, when, on account of the cold weather and ice, work was suspended for the season.

On April 24, 1891, the work of making the borings and examinations was again resumed, and completed July 10, 1891. That portion of the river from Troy to Hudson, a distance of 36½ miles, was thoroughly examined. Where there was no indication of rock cross sections were taken every 1,000 feet apart; where rock was encountered the distance between cross sections was from 250 to 500 feet. Three borings were taken to each cross section, so as to cover a channel width of 400 feet, and all borings carried to a depth of 22 feet below the plane of mean low water where practicable, and samples taken of the material of all the principal bars.

The manner of making the borings and securing the samples of deposit varied according to the exigencies of the case. Where no hard material was encountered and the depth of the water only necessitated a few feet boring, a boring-rod with a steel point 10 feet long was used and pushed down through the deposit by manual labor. In all other cases a 3-inch pipe, in lengths of 3, 5, and 10 feet, connected together by couplings, was used. A drill platform was constructed on the principle of a float, the platform resting on four oil barrels and being supported and steadied by 10-inch by 12-inch hemlock timbers on its sides. Four 3-inch iron pipes were used as spuds, one on each corner, passing through holes in the square timber; these, when let down to the bottom, served to hold the platform in position. An aperture 3 feet by 2 feet was left in the center of the float, and on this a tripod hoist was built, with a block and tackle, to hoist and lower the boring pipe through the aperture. After the 3-inch pipe was driven 2 to 3 feet in the bottom a ¼-inch gas pipe was inserted, through which a jet of water was forced from a donkey engine on board the tugboat, which was used for this purpose, for towing the float and boarding the men. This pipe was jumped up and down on the material in the 3-inch pipe, and the jet constantly playing, the material was forced up through the 3-inch pipe, and by a Y into a bucket, and the material of each deposit thus collected. Doubtful borings were tested with a dredge.

The borings were located by the sextant and platted on the maps. The total number of borings taken was 694, and the total linear feet of material passed through, 6,839 feet, at a cost for plant and labor of $2,365, making an average cost of $3.40 for each boring, or about 34 cents per linear foot boring.

Rock was encountered at a depth of from 7 to 17 feet below mean low water from the State dam to Breakers Island, a distance of 3½ miles. Then for a stretch of 8 miles down to the Overslaugh Rock no rock was found at a depth of 22 feet. From that point for a distance of 1½ miles, to Staats, rock outcrops in places above the 22-foot plane. From that point for a distance of 5 miles, to Mulls, no rock occurs, excepting a little at Cedar Hill Bar, which is west of the channel. At Mulls the rocky formation is well to the westward of the channel. Between Mulls Cross-Over and the city of Hudson there is only one point where rock was encountered, and that is just below New Baltimore, off Matthews Point, and is evidently only a reef running across the river.

Of the samples collected, 24 were selected as representing the character of the deposits of the bars between Troy and Hudson. The material constituting these

t will be noted, consists of coarse gravel near the State dam at Troy, and sand at Fish House Shoal, which becomes finer the farther down stream. oes also will be noted the stratification, where fine sand is encountered, oarse sand and gravel, and underneath fine sand again. As the transport- wer of water varies as the sixth power of the velocity, a current running 3 er second, or about 2 miles per hour, will move fragments the size of a egg, from 2 to 3 ounces. There being considerable slope in the first 4 of the river from the dam south, it is readily seen that the velocity of rrent must be greater, and consequently the material of the bars in this n of the river is much coarser. If the velocity of a current bearing sedi- be checked the sediment is deposited. In running water, with a variable it, coarser material will be carried and deposited where finer was previ- leposited if the velocity increases, and also finer material will be deposited rser material if the velocity decreases, producing perfect stratification. the strata of the material of the several bars can be readily understood.

river erosion takes place on the outer side of a current, because the cur- swiftest, and deposition is taking place on the inner side, because there rrent is slowest.

applies to and explains all the shoals on the river, which are located at points where there is a deflection of the direction of the current and the ty on one side is greater than on the other.

Very respectfully, your obedient servant,

CHARLES G. WEIR,
Assistant Engineer.

t. Col. G. L. GILLESPIE,
Corps of Engineers, U. S. A.

APPENDIX 2.

GRAPHER'S REPORT OF A PUBLIC MEETING HELD IN THE CITY HALL, ANY, N. Y., ON THE 6TH DAY OF JANUARY, 1891, AND CALLED BY THE RD OF OFFICERS OF THE CORPS OF ENGINEERS, CONSISTING OF LIEU- ANT-COLONEL GEORGE L. GILLESPIE, MAJOR AMOS STICKNEY, MAJOR RLES W. RAYMOND, CONSTITUTED BY PARAGRAPH 1, SPECIAL ORDERS 66, HEADQUARTERS, CORPS OF ENGINEERS, SEPTEMBER 30, 1890, TO CON- ER AND REPORT UPON THE OBSTRUCTIONS TO NAVIGATION IN THE HUD- RIVER, UNDER THE PROVISIONS OF SECTION 17 OF THE RIVER AND BOR ACT OF SEPTEMBER 19, 1890.

GILLESPIE. The meeting will come to order. It is taken for granted that ject of this meeting is well known to the gentlemen present, but whether e so or not I deem it essential as a member of the Board of Engineers pres- day to make the official statement that we have met for the purpose of ring information supposed to repose in the people who are assembled here. iver and harbor act of September 19, 1890, made provision for the Secretary r to organize a Board of Engineers composed of three officers of the Corps gineers, whose duty it should be to examine the Hudson River as it now , and report a project and estimate of the cost of widening and deepening s to provide a means of communication from the city of New York to Al- or vessels drawing 20 feet of water; and also a separate estimate for ex- ig this communication to Troy. There is also to be a third estimate for ling a mean low-water channel of 12 feet from Coxsackie to Troy. The so authorized is present here to-day.

existing navigation of the Hudson River gives 11 feet at low water from York City to Albany and 9 feet to Troy. I give these as approximate s.

last project for the improvement of the Hudson River by the General Gov- nt, adopted in 1866, was formulated by the Engineer officer at that time in harge, Gen. Newton, who is, I believe, known to you. It provided for 11 Albany and 9 feet to Troy. The desired results have been accomplished joint efforts of the State of New York and the General Government, both rities having worked harmoniously towards the general good.

will understand that the improvement which is now foreshadowed by the t of Congress requires a very considerable deepening of the river, and if ct had limited the matter simply to the question of estimates the duties of oard would have been very much curtailed. It would have been only pro-

fessional work, and we should probably have made the estimates and submitted our report without conferring with those who live along the banks of the river or are directly interested in its improvement. But, coupled with the requirements for a report and estimates, the river and harbor act contains provisions for the expression of opinions on the part of the Board, which the Board does not regard in every way as professional. They are partly, but not entirely so. These provisions embody three thoughts: First, the usefulness of this new work; second, the value and relations of the new work to commerce; and third and lastly, and which the Board regards as a very important thought, is the expediency of undertaking this work at this time.

With a little consideration you will readily understand that these last requirements are very comprehensive, and the Board has been unwilling to submit an expression of opinion upon them without having first fully conferred with you, in order to ascertain your views, so that when the time arrives for the preparation of the final report we may feel that we had considered every interest, and that the people may feel that the Board had made every possible effort to reach, for conference, those whose interests were involved.

Such, gentlemen, is the case as it now comes before you, and we wish to hear every one who has anything to say in regard to this improvement, its usefulness, its value in relation to commerce, however remote, and as to the expediency of this work. We desire you to submit your views fully, either orally or in writing. A stenographer is present to report the proceedings.

In conclusion, the Board desires to express its thanks to the Albany Chamber of Commerce for the interest it has taken in regard to this meeting, and also to its honored secretary, Mr. Wheeler, for his energetic coöperation, which has done so much to lighten the labors of the Board.

J. HOWARD KING, President of the Albany Chamber of Commerce:

GENTLEMEN: I have great pleasure in presenting his honor James H. Manning, mayor of the city of Albany, who will welcome the Commission to the city, and will open the addresses in behalf of the cities of Albany and Troy in regard to this project.

JAMES H. MANNING.

[Mayor of Albany.]

Gentlemen of the Engineering Corps of the U. S. Army, delegates of the various cities near to or far from Albany, members of the Chamber of Commerce of the city of Albany, as the chief magistrate of a city of a ripe old age and glorious history, and one which has not a blemish on its fair name, it affords me a great deal of pleasure to welcome you, one and all, to our hospitable shores.

The subject which we have to consider to-day is one of great importance, not merely to the city of Albany, but to the State at large. Therefore I do not come before you to satisfy any selfish interest so far as Albany itself is concerned, but I appear here as a citizen of the State of New York to ask that this great project, the deepening of the Hudson River from Coxsackie to the Troy State dam, shall be taken in hand by the Federal Government. The State of New York has done its full share to benefit the commerce of the country, and the object of this meeting has been to enlist people from New York State away out to the Lakes in what we believe should be the great water way from the West to the Atlantic.

We are met in behalf of the commercial and business interests. It is not my place to take up your valuable time by any discussion of this project, and I do not intend to do so. The argument will be presented, after I have finished, by a gentleman who is thoroughly capable to give you all the details regarding the deepening of the Hudson River and the work that has been accomplished both by the government of the State of New York and the National Government. I am somewhat disappointed in not seeing the State engineer, Mr. Bogart, or the ex-State engineer, Mr. Sweet, here, but they may come in later. I feel it to be a duty, as a representative of the State rather than as a mere representative here at the present time of the city of Albany, to call your attention to the fact that in the last two reports of the State engineer consideration was given to this vital subject. With your kind permission, gentlemen, I will read you one section of the report of the State engineer on canals for the year 1888, in which he says:

"Under the provisions of the act to improve the Hudson River between Troy and Coxsackie a large amount of work has been done by the superintendent of public works, amounting to 195,414.1 cubic yards of material dredged and removed from the channel of the river. The engineering connected with this work has been in charge of a small corps, under the direction of the State engineer and

eyor. The report of Mr. Martin Schenck, the assistant engineer in charge, s the details of this work. The dikes erected a number of years ago by the ed States Government are in many places in need of immediate repair. The nditure by the General Government of a comparatively moderate amount in epair of these dikes would prevent the necessity for their entire renewal, h will certainly otherwise become necessary very soon, and would also greatly n the formation of the bars, on the removal of which the State annually has pend a large amount of money."

his report for 1889, which is the last one we have from the printer, the State neer says:

n the last report of the State engineer, in the report of the assistant en- er in charge of the Hudson River work accompanying it, and also in the re- made by the finance committee of the senate on February 5, 1889, atten- has been called to the condition of the works undertaken years ago by the ed States Government on this river. These works are in very bad repair; certainly should be put in good repair, and it would seem that, considering normous commerce passing through this river, the United States Govern- ought to prosecute the works requisite for the maintenance and improve- of its navigation. Large sums of money are spent annually for the improve- of navigation on rivers in other States, while on this great channel of com- cation nothing worthy of mention has been done for years. Unless Congress ld direct vigorous action immediately it certainly will be necessary for the of New York to continue to do more or less work during the next season in to insure free navigation in that part of the river between Troy and Cox- ie, which is now liable to be obstructed by the formation of bars in the spring. ld the United States Government inaugurate measures for improvement of channel of the river it will be advisable that the State should arrange for a ient expenditure to remove such bars next spring, as there is no probability the work undertaken for a permanent improvement by the General Govern- will then be effective."

w, as I understand it, this work has not gone on but nevertheless we find ie report of the assistant State engineer that the State of New York has ributed liberally to the improvement of the Hudson from the year 1797, with exceptions, up to 1890, an amount averaging between $20,000 and $30,000 ear, and the total amount so contributed has been $1,471,429.20. As a citi- of the State of New York I feel that New York State has done its share, a great deal more, and that the Federal Government should now step in.

a further evidence that the Hudson River is entitled to the greatest consid- on from the National Government, I will present a brief statement furnished y Mr. Bogart, and which, I believe, was sent to him at his request by the f of Engineers of the U. S. Army. The statement is brief, is full of meat, is very interesting. I will give you the figures of the amount of money t on river improvement by the Federal Government.

issippi River, amount appropriated from date of first ap- opriation, July 4, 1836, to last appropriation, September 19, 0 (amount for jetties and Mississippi River Commission t included), is	$35,461,980.53
ouri River, amount appropriated from date of first appro- iation, August 30, 1852, to last appropriation, September 19, 0, is	5,551,100.00
River, amount appropriated from date of first appropria- n, March 3, 1827, to last appropriation, September 19, 1890,	4,986,479.25
on River, amount appropriated from date of first appropria- n, June 30, 1834, to last appropriation, September 19, 1890,	1,516,438.00

w, gentlemen, observe the tonnage upon these rivers for the year 1890. On Missouri River the tonnage was about 865,493; on the Mississippi River, in all, 0,000; on the Ohio River, 6,000,000, and on the Hudson River, over 18,500,000. e spirit of fair play and justice I feel that the Hudson River is entitled to reatest amount of consideration on the part of the United States Govern- , and I also feel that this excellent Commission which has the matter in ge will give the subject the consideration which we as enthusiastic citizens e State of New York honestly and sincerely believe it is entitled to.

w, gentlemen, I will not take up more of your time. I did not intend to say so much, but I felt that this bit of inside information which I had would aps be of some service to you; certainly that it would be interesting.

In concluding my remarks permit me to say that the mayors of many cities are unable to be present here to-day, but many of them have sent their regrets and have expressed their entire approval of this plan of deepening the Hudson. I have also, as mayor of this city, received regrets from four or five governors whose States border or touch the Empire State, and I am just in receipt of a communication from a gentleman who is always interested in public improvements, the chief executive of the State of New York. He says, under date of January 6, 1891:

MY DEAR SIR: I had expected until this morning to be able to accept your kind invitation to attend the public hearing at the city hall to-day before the commission of Army officers with reference to the feasibility of deepening the channel of the upper Hudson River, but I find now that my official duties during the day and my expected departure for New York this afternoon will prevent my attendance. I send this communication hurriedly, merely to express my interest in the movement which has been initiated for the improvement of navigation in the Hudson River, and to assure you of my hearty coöperation in any feasible plans which may be agreed upon.

Very truly, yours,

DAVID B. HILL.

Hon. JAMES H. MANNING,
Mayor's Office, Albany, N. Y.

HON. VREELAND H. YOUNGMAN.

[Representing the Albany Chamber of Commerce.]

Mr. President and Gentlemen of the Convention: This matter of the navigation of the Hudson River is one that has been of the deepest importance, not only to the citizens of the State of New York, but the merchants, the farmers, the mechanics, and other citizens of States far beyond us, north and west, for many years. Much has been done to improve this navigation, going back to the early times when vessels were navigating this river for the accommodation of the inhabitants along its shores. The depth of water was not a matter of much consideration, because the vessels at that time did not need it. But as freights became heavier and greater quantities of it needed to be transported, it seemed necessary, from time to time, that additional depth should be given to the waters of the river. I will read, in better words than I can put it in myself, something of an historical kind of what has been done toward deepening this channel. It is taken from senate document of this State (No. 38, Febuary 5, 1889), relative to the improvement of the Hudson River, which was prepared by some of our ablest statesmen.

"In the annual report of the State engineer for 1886, Charles G. Witbeck, assistant engineer in charge of improvements in the navigation of the Hudson River, comments as follows upon the subject:

"'The deep water of the Hudson River extends from Governors Island to about midway between Stuyvesant and New Baltimore, from which point northerly to the State dam at Troy the water is comparatively shallow, and navigation has always been attended with more or less difficulty on this part of the river. The problem of improving this portion of the Hudson River, by reason of its tortuous course, extreme breadth, and the peculiar actions of its tides and heavy freshets, is one that has called forth the best energies of both national and State engineers of the present century. The importance of this water way being conceded by all as being of vital character, as it is the outlet of the entire canal system of the State of New York, which has in the past carried the greater portion of the products, not only of this State but adjoining country, and in the future will always be an important factor to the welfare of this State.

"'The first record of any permanent improvement contemplated was in 1797, when the depth of water between the above-named points was only 4 feet at mean low tide, which stage of water continued until about 1819. From 1797 to 1863 the amount of $225,707.25 was expended by the State authorities, for which an increased depth of 3½ feet was secured, making a total depth at this period of 7½ feet at mean low tide.'"

In sixty-six years this depth of water was increased 3½ feet only, and then we had but 7½ feet at mean low tide. So that the statement of the president of the Commission that 11 feet of water was secured from New York to Albany shows that much has been done for the improvement of the navigation of the Hudson

River. Now, in connection with that subject, I will quote a few words from the Committee itself as it exists in the report:

"This link in the chain of facilities for water transportation affords the cheapest means of forwarding property between the West and the East. Its uninterrupted navigation, therefore, during the season when transit is unimpeded by the elements, becomes a matter of vital importance to various interests and to large numbers of people."

It seems to me that the use of this word "link," in that sense, is very applicable. Truly, as we consider this subject, this Hudson River from Troy or Albany to New York is but a connecting link to the great Northwest and the ocean. Now, as I understand the project that we are considering to-day, it is to take that link out and trench a clear way from the ocean to the canal. Make it all one. Give this canal an opportunity of having vessels discharge their cargoes at once upon arrival here or at Troy and then return, and so increase the carrying capacity upon the canal, and in every way give advantage to the canals as a transporting medium. Now, this matter of water transportation is one which, of course, has been considered by the greatest minds of our legislative bodies. We have had reports upon it at different times, and almost invariably those reports have favored the encouragement of water transportation, so as to reduce the cost of carrying the products of our farmers and mechanics, and other products, to the destined points. In this same document this same committee has very wisely included some extracts from a speech delivered by our present Secretary of the Treasury, Mr. Windom, when in the United States Senate, upon a measure then being considered before that body.

Mr. Windom says: "The chief instrumentalities by means of which those competitive forces will exert their power are the Mississippi River on the one side, and the northern water routes on the other. * * * Both routes constitute indispensable parts of one grand system. * * * Each is needed to regulate the other, and both as regulators of railway charges. Each has some advantage which the other lacks, and some impediment which the other has not; but on the whole, their trade forces commercial facilities, and economic capacity for cheap transportation will be so evenly balanced as to insure a healthy, active, and permanent competition.

"* * * But the competitive power and influence of the two great contestants (the water and railroad lines) will not be limited to any one locality, but will extend to nearly every State in the Union."

Allow me to call your special attention to what follows, as it relates particularly to what is before us:

"The wide sweep of competitive influence exerted by the Erie Canal is not generally understood or appreciated. You would doubtless be surprised, Mr. President, if I told you that the 'little ditch' which runs through your State holds in check and regulates nearly every leading railroad east of the Mississippi River, and that it exerts a marked influence on the cost of transportation over all the country, extending from the interior of the Gulf States to the St. Lawrence River, and from the great plains of the eastern foothills of the Rocky Mountains to the Atlantic Ocean. And yet such is the fact."

In this same document the committee state further:

"Looking, therefore, at the beneficial results of the system of water ways which reach the entire length of the State, free to all who choose to navigate them, and of which the Hudson River is a part, results by no means confined to the State of New York, but participated in, directly and indirectly, by the citizens of every State of the Union, and noting the established policy of the General Government to promote the interests of commerce upon all of its lakes and rivers, appropriating many millions of dollars annually for that purpose, there can be no good reason why the Hudson River should not be the recipient of Federal benefactions to the full extent of its needs."

Can anything that I can say add to the force of those words given before the highest legislative body of the United States, and, I think, of the world? I won't attempt it. It seems as if this was an undisputed fact—that this question of water transportation is one that we must foster and encourage. Not to harm the railroads. I would not say one word in any way to deteriorate the respect which we all feel for those men who place their money in railroads, and who manage them so successfully. Not at all. It is simply one other avenue of communication. It is no worse than two railroads running in competition. We have in New York no less than seven. As this country increases we want more methods of transportation. Here is a chance to add to the present facilities for transportation.

Another point in this matter is this: The canals of this State belong to the State. They can never enter into combination with the railroad companies. They are controlled by the State absolutely. There can be no combination. But look what we may save to the people who are shipping. The difference in the carrying expense of transporting grain or lumber, or whatever products of the machine or hand we may desire to ship to foreign lands, by transferring it at Albany or Troy rather than at New York, would be saved, and from what experience I have had, I believe that there would be no extra charge from Albany or Troy to foreign lands than from New York for the sake of getting the cargo and vessels if they were actually coming to Albany or Troy. I don't believe the charge would be one cent more than it would be from the harbor of New York. When we consider the immense amount of transferring that is going on in the harbor of New York, and the expense and delay that is caused to vessels by the lack there of dock facilities, I believe that they would much rather take ten or twelve hours to Albany and ten or twelve hours to return than to put up in the harbor of New York.

Now, as to the quantity carried by canals during the time of canal navigation. Taking the report of our superintendent of public works, I find that from May 1 to December 1, 1889, the canal carried 43.31 per cent of all the cereals that arrived in New York, largely for export. I am told by gentlemen in the business in New York that the preference is for exporters to take canal boats and their cargoes, and I have not the least doubt that if Albany and Troy were made ocean-shipping points, that the whole of the exports or at least that of the grain coming in from the canal would be used for export. So that I think it is safe to calculate that the amount of grain that would be exported would be all that came through the canal. Doubtless the business would be done by the merchants now in New York. It would not change their business, but the loading would be done here. The commission merchant would naturally want to save every dollar he can in the transportation of that grain or lumber, or whatever it might be, and they would contract for those boats to discharge here and take on cargo here, instead of at New York, and save the additional expense. When we come to this question of expense, it is generally understood that any additional expense in the way of transportation generally, and, I suppose, invariably, comes out of the producer. Whether he be a farmer or a lumberman, whatever article he produces is worth a certain price at a certain destination. All that can be saved in transporting that article to the point of destination would inure to his benefit at an enhanced value at the point of shipment. So that all that can be saved in the way of transportation would inure to the benefit of those who ship, or the producer.

Now, to encourage shipments by the way of the canal, the State of New York in 1882 made the canals free of tolls. Not one cent has been charged since then for tolls for any property carried through the canals. They have been maintained wholly at the expense of the State of New York, and that expense is very considerable, amounting to nearly three-fourths of a million annually. I think last year it was seven hundred and odd thousand dollars, but the annual expense will run about three-quarters of a million. The State will be contributing toward this commerce about three-quarters of a million annually in the improvement, and betterment, and encouragement of the canal by doubling the locks. In doing this they propose to double the capacity of the canal. The capacity is limited principally, and I don't know but wholly, by the amount of work that can be done at the locks. No matter how many boats may be on the canal, only so many can pass through in twenty-four hours. This lengthening of the locks, so that two boats may pass through, will consequently just about double the capacity. This will be completed within two or three years; sooner than this ship canal can be completed.

This canal was built by the State of New York. Not only this Erie Canal, but several of the others by the State, without assistance from any other State, and without a dollar of assistance from the United States. It was a risky question as to whether it was a success or not, but it at once proved the greatest boon to the Northwest. It opened up a line of transportation where they could raise grain, lumber, etc., and send it to market; place it in the hands of the people who wanted to use it at a comparatively little expense. The canal has been finally enlarged by the State at large expense and now they are going through with this enlargement at great expense with all of them.

The State of New York is deeply interested in this canal transportation, and they appropriate annually a large sum of money for maintenance, and its real benefit goes to the people of the West, who are given free transportation to the ocean.

We now ask that we may have this improvement of deepening. Look at

hat the Canadians have been doing. Look at what they have done with
te St. Lawrence River. See how materially they have improved it. Shall
e meet them in these great works of improving the means of water communi-
tion, or shall we lie still and let them run away with us in this matter? The
. Lawrence River, years ago, was only navigable as far as Quebec for any ves-
ls requiring any depth of water, but they have deepened that channel so that
ey can go 159 miles farther up the river to Montreal. Their canal, of course, is
uch deeper and wider than ours. Vessels that go there draw 10 feet of water,
hile ours draw only 6. But they have increased their capacity for carrying
ain and lumber from the Northwest. There are large amounts of lumber sent
rough the Canadian canals and shipped to foreign ports. To send this through
our routes would increase the expense very materially, so it goes through the
nadian canals; but give us sufficient depth of water, and the result in the in-
eased traffic everywhere would be a great benefit to all. When you place in
e hands of the people increased facilities for reaching markets, you add to the
osperity of the country. If we had the Canadian's facilities of transportation, I
not think we would harm them, but would benefit ourselves by adding to the
lume of business done through our canals. The St. Lawrence River was deep-
ed to 25 feet years ago, and now since it has been completed, I think they have
ded 2½ feet, making it 27½ feet. Now, we are not asking for that depth at pres-
t, and we may never ask it; but the largest draft steamers go to Montreal.
hat we do ask is that the largest freighting steamers may be brought to our
rt.

Then again, the question of terminal facilities in New York is, I think, a very
portant matter. Any of us, who are familiar with New York shipping matters,
ows very well that the terminal facilities are not sufficient for the present needs
business. They are not being added to as the business increases. There is
eat delay, expense, and trouble at present for facilities whereby vessels may
loaded or discharged. The room is limited, but the needed additional room
here, and would be utilized if it was found to their advantage; and I feel quite
re that I make no mistake when I say it would be found to be largely to their
lvantage. The mayor has stated very clearly and very succinctly the appro-
riations which had been made, and I am very glad that he gave them to you. I
ant to emphasize the fact, however, which he gave you in that compilation of
gures. It is, that the Hudson River, with a tonnage of 18,500,000, has received
om the United States Government $1,516,438 for the betterment of its naviga-
on, and that these other rivers, the Ohio, the Mississippi and Missouri, men-
oned by the mayor as having but two-thirds the tonnage of the Hudson, have
eceived $45,999,559. Now, the combined tonnage of these three rivers is but
ne-third of that of the Hudson, and yet they have received thirty-three times
s much money for the betterment of navigation. I do not mention this as desir-
ng to make any complaint or any unfavorable comparison. Not at all. I have
ot the least doubt that those appropriations were wisely made, greatly needed,
nd wisely expended, but it does seem as though we were entitled to a fair con-
ideration of our needs and our wants for a plan which will enable us to carry
essels of good draft to our inland water ways. The Hudson River is of so much
mportance that it should have proper consideration, and, although I am glad
hat what has been done with others *has been done*, we simply ask that we should
eceive consideration with those others in that we should have the same amount
f money, and we hope we shall be given that which we feel we need. All the
noney which the United States has appropriated and spent on this river since
here has been canal communication, would not have given us canal communica-
ion. It would not have given us 6 or 7 feet of water.

Speaking of this as a public matter, I do not think it would be in the right
way of things to bring in the question whether private investments are made in
he same line as public investments. By statistics we find that about 6,000 miles
f railways are built annually—sometimes more and sometimes less, but that is
he average amount. This, of course, is built with private funds. Well, you
may say to me that this is done for the sake of investment for making money.
We all of us, particularly those who live inland, know very well that when a
railway is projected to a far country the towns and villages on its line, and the
individuals belonging there will subscribe quite liberally to the stock. Not
for the sake of remuneration but to open up the country, and many do this
with no idea for a return other than that it will open communication, whereby
the products of their mills and farms and factories will be taken to a seaboard
town, and from there on to some great consuming quarter. Now this money
is invested in this way; and the statistics which I glean from the last annual
report of the Interstate Commerce Commission show that on June 30, 1889, the

amount of railroad stock in this country was $2,621,431,792. That is a great amount. Now 61.67 per cent of all that immense amount of money was paying no dividends whatever; and actually we would say that all that money was not put there voluntarily with the idea that they would not get any return for it. I do not claim that for it. I claim that is the result, and men in cities with money know very well that the chances are about one to one as to whether they do make anything or not, but the money is placed there with a view to opening up the country and placing the different places so opened up in communication with other places, and by doing so, it is one more link toward making us a community of interests.

Now what bearing has all that in this business here? A great deal. We ought to encourage people to invest their money in this way. How? By giving them every facility in our power for putting these tracks in the ground to carry these products, and by bringing the seaboard as near the farmhouse door as possible, and we do that when we carry this ocean channel up to the head of navigation on the Hudson River.

Then again, the United States have a very important plant only 16 miles above Albany—the Watervliet Arsenal, a place which will in a very short time become a most important point to the Government. Give them a chance to bring their war vessels to this point. In case of a war, any one or two nations might probably blockade the lower end of the Hudson River. There is no doubt but that at the present time, they might do so. Foreign vessels would not come away up here, and our vessels could receive stores, arms, and supplies here. The distance they could come up the river would simply be a hiding place for them.

I have kept you longer than I have intended to to-day, because I know that many are present who desire to speak, and who can take up this subject and discuss it in a much more able manner than I can; but we do ask from yourself and your colleagues that, in making your report, you will consider the needs and the requirements, as expressed to you, for the deepening of this river, so that in the future, and I trust in the immediate future, the producers of the West and the Northwest may go direct by water to the seaboard of New York and other points. Albany is interested in this, but it has no selfish motive which prompts it in asking you to grant the requests of the representative gentlemen who are assembled here before you. The generous responses made from all parts of this State and from other States show the deep interest that has been awakened throughout the country. It is a very important matter, and it reaches to a great distance. Albany comes in here with its greeting to you all, and with its welcome to all its friends who are assembled here this morning, and with the pledge that if you will join with us in asking that this work be done, we will join hands with you and will hold tight fast, until we have accomplished our object.

E. P. DURANT.

[Representing the Albany Board of Trade.]

The Board of Engineers and Delegates, I have the honor to represent the Board of Trade of the city of Albany. This Board of Trade is, I believe, the oldest organization of the kind in the country, and especially the oldest which exists under a State charter. Perhaps it is that age does not count for anything, but there is a reason for alluding to it which leads up to this matter which is now in hand. There are men now living in this city who did business as merchants long before the Erie Canal was built—when the channel of commerce was by wagon road, and this wagon road with its traffic suggested the great water way which followed.

Now, Mr. Chairman, between the Alleghanies and the Rocky Mountains there is a body of arable land the greatest in extent and fertility of any on the globe, and very much of this is tributary, commercially, to the Great Lakes, and it is a fact that the only water way that is feasible at all from the Great Lakes to the American tide water is through the State of New York—is down this Erie Canal and down this Hudson River. The mountains on the other hand preclude forever the idea of a water way. Allusion has already been made to the vast influence and the vast power that this water way has exerted in the development of the whole country. The Middle States, the West, and the great Northwest could never have developed as they have but for this water way. If I am rightly informed the commerce of the lakes exceeds the commerce of Great Britain. The tonnage through the Sault St. Marys Canal exceeds the tonnage of the Suez Canal, and I think that very few understand the vast import of that lake traffic and, as I have already said, that traffic annually finds its way to the American tide water through the State of New York and down the Hudson River.

Now, as it is within so short a time that this great work has been done and that this channel has been developed, does it not argue the importance of this water way? Does it not argue the interest for its deepening and the development of all that is connected therewith?

I do not propose to traverse the ground that has been so ably traversed by my friend, Mr. Youngman, and it belongs to others to present statistics and reasons why this work should be undertaken and why it is feasible. I only want to emphasize one point that was made by Mr. Youngman. It is with reference to handling property in the port of New York destined for foreign shipment. Now, if those restrictions or the additional expenses of transfer existed in the harbors or the commercial cities of the Great Lakes it would, I should almost say, ruin their commerce, or at least greatly retard it and greatly diminish the progress of development. Now, as you know, in the cities of Chicago, Milwaukee, Detroit, Cleveland, and Buffalo large vessels can go alongside the warehouses and receive their cargoes direct and move off with them in a few hours to their destination, whereas in the harbor of New York there is wharfage and storage and delay by reason of lack of dock facilities and all those things which hinder commerce. As Mr. Youngman has said, you will bring the ocean vessel to Albany, where she can receive her cargo direct in same manner as the vessels receive their cargoes at all of the Great Lake ports. The railways and the docks and the warehouses there are all constructed with a view to the accommodation of such vessels. If this work is accomplished the ocean vessel may come to Albany and receive its cargo direct from the warehouse, and by that the expenses of transportation would be vastly diminished, and those are the expenses which finally have to be distributed according to the laws of commerce, and every interest feels it. This work will assist in the development of the whole country, and the farmer, the mechanic, all interests—those who live at the most extreme western point will share in this development, and it should meet with your favor. The force of circumstances, the force of the development of commerce as induced by the State of New York at the expense of millions so as to provide this great water way call for favorable action upon this projected improvement. I say that the interests for the development of the country have forced this matter upon the State of New York, and the State of New York has not been still but has taken up the burden and has borne it, and now it seems to me that it is time for the United States Government to weigh all these considerations, and make a great effort to develop this great water way upon which the prosperity of the whole country, especially of the West and the great Northwest, depends.

HON. MARTIN I. TOWNSEND.

[Representing the Troy Citizens' Association.]

Gentlemen of the Corps of United States Engineers, so much has been said this morning, and so much has been well said, that I am very much at a loss as as to where to begin in the remarks that I am to make and in the track which I am to pursue. But there is one branch of discussion which it is important that I should not neglect, and that is the shape of this law authorizing this survey. The conclusion is that by it the little Hudson River is very much like a snake with his back broke in the middle. There is a breaking of the back at Albany, and therefore, while we are all friends and pursuing the same object—no rivalry about it—yet it is meet that we should consider whether there will be any use of extending this work beyond Albany. And about that I propose at first to direct my attention.

I have consulted a few statistics from the report of our superintendent of public works, and those statistics I deem to be of very great importance, and I beg leave to hand up to the committee a small pamphlet on the subject. It is not original with me. They are taken from the report of the superintendent of public works for the year 1889, and I present it for the purpose of showing that there is a vast amount of business done on the Hudson River in connection with the northern and western canals, above the city of Albany.

In the first place, we have directed our attention very strongly to the Erie Canal. But there is another canal that it is necessary to consider.

The tonnage in 1889 upon the Erie Canal was 3,673,554 tons. Upon the Champlain Canal the tonnage was 1,187,038 tons. So that here is a very large business indeed done upon the northern canal and passing this point. Now, realize the business that this northern canal has brought into the Hudson River. If you will have the kindness to look below you will find that the number of tons carried on the northern canal (at page 236 of the Report of the Superintendent of Public

Works in 1889) to be 9,928 tons; from West Troy, 6 miles above here, 171,220 tons; from Waterford, 502,229 tons; from Whitehall, 503,661 tons. For this purpose, I suppose that the tonnage at Whitehall need not be considered, but it will be seen that there is about 700,000 tons from the northern canal that comes in at West Troy and at Waterford. Now Waterford is 9 miles above here and West Troy 6, and the whole tonnage almost of the northern canal, all, I believe, except its lumber, which is taken very largely at Albany, goes into the Hudson River at Waterford, and the State in its early works erected there what is called the State dam for the purpose of raising water enough above that dam to enable the boats from the Champlain Canal to come to Waterford. We have a State lock which secures those boats there. This shows the importance of the northern canal, which carries 1,187,000 tons. It shows the importance of that canal by the extension by the State of this navigation up to the State dam.

Now, in regard to the western canal. The tonnage carried east and west on the Erie Canal in 1889 was, from Albany, 182,819 tons, and from West Troy, 738,173; about four times as much. The property which was left at tide water from canals was, from Albany, 1,022,901 tons; from West Troy, 1,618,756 tons; from Waterford, 137,772 tons—carried clear through from Waterford for way purposes. So that the business above here as done by the canals here is, you see, vastly in excess—certainly four times—above Albany, than at Albany. I might say with great propriety that a considerable proportion of this work is done by Albany men and Albany shippers at West Troy, but there is the place from which these canal boats have got to be carried on the Hudson River when you go into that river. It was well said—the quotation by Mr. Youngman was of great importance—that of what the Erie Canal in 1889 carried to the State of New York, the corn, wheat, oats, peas, and barley, 47.13 per cent of it arrived at your city.

Now I propose to look for a moment at that western country. The western country north of the Ohio is a grain-producing country, and the State of Kentucky is largely in the same condition. Missouri is a grain-producing country, and so with Kansas and the whole country to the north. The grain from all these States don't go South, with the exception perhaps of a minute quantity of corn for consumption of farmers, or planters, as they are called at the South. The grain is either consumed at home, or seeks the great ocean through the Northern States, and some through the Middle States, but it does not go South, and the building of railroads has prevented the general commerce of the Northwest from going down the Mississippi to anything like the extent it formerly went. Indeed the Mississippi is, as the newspapers here are fond of saying, almost "a back number," so far as commerce is concerned. The tonnage of the Mississippi is not two-thirds of the tonnage of the Hudson River alone, and it is because the facilities for moving the products north of the Ohio River and north of the south border of the Missouri River have been increased until they are so great that nobody thinks of carrying them around by way of New Orleans. With the exception of the productions of the West Indies, St. Louis now almost wholly depends upon her communications from the East. Every year there is less and less done on the Mississippi, and the Mississippi steamboats that were so numerous, and their whistles which were so often heard, are now things of the past. I say this in no disparagement of the Mississippi. In the late struggle for the common union of the whole country we got the Mississippi into the Union, and there we will have it, but I speak of it now in comparison with our own river—the Hudson. Now, that river has had about thirty times the appropriations for its improvement that this Hudson River has had. Not that those appropriations were not useful. God speed the appropriations, and if the Commission which represents the whole United States here will allow me to say a word, I will say that I have sat and heard discussions about the Mississippi River in the National Congress for about four years, and I thought there was more propriety in benefiting their farmers than their commerce. Every bayou has to be headed off. The Mississippi has to be banked up and levees made all the way, and for what? But we are one people. Let them give us our share and they may have theirs. The West has waked up in regard to this matter. I went before the Committee on Rivers and Harbors in the last year, and I found as ready a body of men, with as ready lips in the good cause, especially those who lived north of the Ohio and the southern border of the Missouri, as we could have found in the State of New York. And it is a great world—the world that is inhabited by the men whose products are carried through the State of New York to other homes. And it is a world of our people to a great degree. They went from here. Don't be afraid of the recommendation with a view that Congress will frown upon it. They went from here, and they sympathize with us. They sympathize with the men who, when the

country was poor, constructed the Erie Canal—to-day the honor and pride of the country. The man who lives in the State of New York has the right to step an inch higher. Here is the State that furnishes an avenue of commerce for the Northwest and West with the great outside world such as has not been done by any other people in this country. The canals of Pennsylvania and some other States have been a failure, but our canal here is one of the great water ways of the world, worth a hundredfold what the Dardanelles and the Bosphorus are, and if we go in the proper spirit to the National Congress, they will not say us nay.

Now, I have said a little about my own neighborhood up the river. Albany claims 103,000 people, and she has got it, and I hope she will have as many more. God bless her in her prosperity and keep her from adversity. We claim that clustered about Troy, and at Troy and within the roads four or five miles east and west, we are over 125,000 people, not to count in West Troy nor Green Island nor Cohoes nor other places up there where there are so many factories. They live on and eat iron, largely, up there.

Mr. TEFFT. The brass is in Waterford.

Mr. TOWNSEND. My friend is mistaken. The brass is to be found elsewhere. All these places, however, are prosperous, and adding to the happiness of the whole people. Not that we are trying to run Albany. She has to take up a part of our own count to make up her population. Greenbush is part of Albany's estimate, and she is entitled to it, for they work here. If Albany prospers they prosper. We will all prosper together if this enlargement of the river is carried to the State dam, where it should come if it is undertaken, and where I think it will have to come, or it will stop in the National Congress. We have got a Vermont up there, and we have a New Hampshire up there in certain regions. If that be done, Albany is benefited, we are benefited, the nation is benefited, the world is benefited, and we are all happy.

Just one word to the commissioners:

If the Government should undertake to legislate for the improvement of this river, there will have to be some laws which we do not now possess for the preservation of the work that is to be done. Having held the position of United States attorney for this district for about seven years, I found that the Government was practically powerless to preserve the works placed in the river. There should be some legislation to this effect, and I suggest it, as it may be desirable to recommend it.

F. H. HOLBROOK.

[Secretary of the Board of Trade of Muskegon, Mich.]

Gentlemen of the Board, under a resolution of Congress the Secretary of War has appointed a board of three United States engineers whose specific duties are:

First. To determine and report a plan, and estimate the cost for the deepening of the Hudson River from Coxsackie to Troy (a distance of about 30 miles), so as to admit the passage of vessels of 3,000 tons burden.

Second. To report a statement as to the usefulness of such improvements and of the relation and value to commerce.

In the line of the performance of the second duty, namely, as to the usefulness of such improvements and of their relative value to commerce, an expression is invited from the various commercial interests of the country. To receive such expressions the board is now met.

If the late statistics of this country are given the proper consideration, no trouble will be had in arriving at a proper conclusion that the projected improvement is a step in the right direction.

To understand the far-reaching effect of this contemplated improvement, it is necessary to understand the commercial battle-ground of the nation.

Of the five great natural divisions of the country, three, namely, the Atlantic, Great Lakes, and Mississippi drainage basins, transact nearly nine-tenths of all the business of the United States. These three are located as follows: The Atlantic basin on the east, the Great Lakes basin in the center, and the Mississippi basin on the west. At the bottom of each of these basins (so to speak), or at the lowest water level of each, is found a constellation of cities, which are the distributing centers for their respective basins. The bulk of the tonnage of the country moves in an east and west direction. These three great commercial districts are joined together, east and west, in two ways, namely, by railroads, and by water ways. The system of railways is the greatest of any in existence in the world. The system of water ways is grand, so far as nature's work is concerned, for it has given to each basin a system natural to itself, but practically uncon-

nected with the others. To supply these connections, these missing links, man steps in and builds canals or artificial water ways. The Erie on the east, connecting the Great Lakes and Atlantic basins; the Illinois and Michigan Canal, and others of similar character, on the west, connecting the Great Lakes and Mississippi basins.

It will be seen clearly, then, that the only great east-and-west water ways in the United States are in two parts—natural and artificial. The artificial part is under State control, and it is not urged or claimed that its improvements should be a Federal charge. The natural water ways of these three great drainage basins, of which the Hudson River is a part, are under the Federal control, and its improvement is properly the duty of, and should be at the cost of, the General Goverment.

When the volume of tonnage moving and its trend is considered; when it is seen that these artificial links, joining the three water ways, are the only check upon the railway systems, then their importance becomes more apparent, and any improvement to bring these three water ways more closely together and shorten or improve, so as to render the artificial links more effective, is a matter of national importance.

We are a nation of sixty-two million people, and we pay to the railways for transportation over $1,000,000,000 annually. This is $16 each for every man, woman, and child, or $80 for each head of a family of five persons. It is a disbursement nearly equivalent to paying off the national debt each year. A small percentage of this yearly tax upon the productions of the country applied to the water ways would afford a vast relief, for we have it from the best authority in the country on transportation—Poor's Manual—"that products can always be carried by water at about one-third the cost by rail."

If a sum equivalent to sixty days' receipts of the railways was expended in making proper connections between these three great water ways, it would afford a yearly saving to the people of many times the cost.

That there is serious need of improvement of the water ways requires no better proof than can be found in a contemplation of the condition which the lack of them has helped largely to bring about. The great grain-raising portion of the United States is the Mississippi Valley or Basin. If we are to judge of the prosperity in this industry by the Government tables, a dissection of those tables is in order, and will show a condition far from inviting. In 1880 the total cereal crop was, 2,718,193,501 bushels; average since 1880, 2,759,337,073 bushels. Number of acres tilled in 1880, 120,926,286; average since 1880, 133,738,585. Value of all cereals in 1880, $1,361,497,704; value of average since 1880, $1,288,453,248.

It appears from these tables that the farmer tills 12,812,299 more acres, raises on the average 41,143,572 more bushels, and has received on the average for his toil $73,044,456 less money than he did in 1880, notwithstanding the fact that there are twelve million more people in the United States to be fed.

This condition is due to several causes, one of the principal ones being a lack of proper transportation facilities. This class would receive a better share of the fruits of their toil if the Hudson River and the Erie Canal were improved on the east by the Government and the State, respectively, and the great system of water ways of the Mississippi Basin was connected properly with the Great Lakes on the west, as the latter improvement would, in effect, change the great north-and-south river water way (which is comparatively useless now in transporting products bound east and west) into an east-and-west water way, making a large portion of it, at least, in accord with the principal movement of tonnage.

'Tis true that the farmer class have now an abundance of railway facilities. In fact, where he had 1 mile in 1880, he has nearly 2 miles in 1890, the mileage in the two periods being 93,000 and 167,000, respectively, in the whole country. His average cereal crop has increased less than 2 per cent in a decade, while his railway facilities have increased about 80 per cent in the same period; for it is safe to say that in the general increase in mileage throughout the country his district has not lagged; on the contrary, the iridescent dream of wonderful increase in crops has been a potent factor in floating bonds for increased facilities in his district, and since farms and outlying property bear peculiar relations to railways, he finds that his products, with no considerable increase in volume, must pay the fixed charges on 2 miles of road where formerly they paid on one—for what but the productions of the country must pay these charges, if they are paid at all? If he looks with expectancy to increase of population to help him out, he meets these figures: 50,000,000 population in 1880 to 93,000 miles of railway, or 537 to 1 mile; 62,500,000 population in 1890 to 167,000 miles of railway, or 375 to 1 mile. In other words, he finds that there are 162 less people to support a

mile of railway in 1890 than there were in 1880. He evidently has need of more water in the canals and rivers or less in railway stocks, or both.

We have endeavored to show the situation with respect to a large percentage of those who till over 133,000,000 acres of soil, a class who represent by the Federal census of 1880 over 7,000,000 out of a total of 17,000,000 workers who earn their bread in the sweat of their faces. The same condition obtains with respect to other industries, though in less degree, as they are more accessible to water ways.

In considering this question, it is well to weigh the following facts: That the entire exports and imports of the country, considered on a standard of their money value, amount to less than $1,800,000,000 per annum, while the yearly products of the interior amount to five times that sum, and are principally moved in one direction or another within the limits of the three great districts named. That since the removal of tolls from the Erie Canal in 1882 the district along the great east-and-west water way has shown a remarkable development. An index of this fact is seen in the steam-vessel building. In 1888 it was, by the Government reports, 68,208 tons on the Great Lakes as against 19,572 tons on the Atlantic and Gulf coasts combined.

The new census for 1890 shows that about 40 per cent of the gain in population occurs in the eight States lying along the Great Lakes, and a late census bulletin shows that over 96 per cent of all the steel output for 1890 occurred in six of these, and that this 96 per cent exceeded in volume the output of Great Britain for 1889 by nearly 100,000 tons and our own output for 1880 by 290 per cent.

A statement of these facts carries with it a suggestion that there is no impropriety in the Government lending its aid to any part of a system which makes such a meritorious showing.

In conclusion: We have made our argument on the water ways, considering them only in the light of an entirety. If we have shown the necessity of their improvement as a whole, the necessity of this particular improvement under consideration must be apparent, as it is a part of that whole. It is an improvement that should receive encouragement from every part of the land, as it will lead to greater prosperity, and under the showing is it not clearly the duty of the Government to lend its aid in lightening the burdens of the people?

COL. C. L. McARTHUR.

[Representing the Troy Citizens' Association.]

Mr. Chairman and gentlemen of this body, I did not come here to-day loaded with statistics or anything of that sort to urge the necessity of the improvement for which you have met here for the purpose of promoting. Whatever I say I shall say from the shoulder, as they fire in the Army, and say it as thoughts come to me.

This idea of the improvement of the Hudson River does not owe its origin to the city of Troy. It does not owe its origin to the city of Albany. It does not owe its origin to the great West. The National Government, as long ago as 1797, adopted and took action in Congress looking to the promotion of navigation on the Hudson River and of slackwater navigation up to the Champlain Canal, more than a quarter of a century before the State of New York had a single canal. They did that for defensive purposes, and if you will look for an instant at the history of the country you will see that in all the great wars which we have had, except the last war and the war with Mexico, that it was on our northern border here and which was menaced by invasion, and the great problem of Government was to protect our frontiers; and while I do not desire to commit this body or these gentlemen to my own thoughts in this matter, yet as we are here to discuss this I think it ought to be discussed in its length and breadth.

The National Government undertook this thing for defensive purposes. You will remember that the great battles were on this frontier. You will remember that the backbone of the Revolution was broken at Saratoga, at Bennington, at White Plains, at Ticonderoga, and at other points on our northern frontier battles were fought, and that the objective point was the city of Albany.

Now, sir, whatever may be true of this work as a commercial project, I leave for others to discuss; but this question has a wider and broader sense than any commercial one. The main and ultimate end of this thing is to make a water way from the Hudson River to the great chain of lakes—that chain of lakes larger than the Mediterranean and the other seas, and, as has been well said here, the great wheat and grain and beef and produce producing regions of the coun-

try. The first want of man is to take care about his food, and these people are furnishing food not only for themselves, but they are furnishing food to the extent that commerce and the laws of trade will permit. They are furnishing food for the world, and it is through our connections with the great chain of lakes that this thing is to be done. The State of New York is proud to be in advance of the General Government in all works of this character. Why, we spent in the single year 1889 within a fraction of one hundred thousand dollars as much for the canal system of this State of New York as the whole United States in all its existence has put upon the Hudson River. And but a small proportion of this was for the benefit directly of the people of the State of New York. It was to more extent for the arms of the sea and the water ways to that great and fertile West, so that produce might be cheapened, and that railroads might be checked in their exorbitant demands; that we should bring cheaper food to the mouths of the people of the eastern side of the continent, and from there across the waters. I think this should be preached as in the nature of a defensive measure of the country. Sir, the existence of the honored branch of the National Government to which you belong means the defense of the Government and the country in its hour of peril. When you come to look at what Great Britain and Canada have done in this matter, it is astounding that this Government has not waked up to the necessity of protecting our western as well as our eastern borders. Why, sir, the Canadian and British Government have expended on her water ways, and largely with a view to defensive purposes, $200,000,000. They have deepened the Welland Canal to the depth of 14 feet, and it is the policy of the British Government to-day to protect and aid her shipping, and to build that class of steam vessels of such burden that they may be employed in commerce in the Canadian and other canals of the country, and be converted speedily into cruisers when the time for defensive operations comes. The British Government in its navy have one hundred and twenty-five ships of good size that may be taken through this Welland Canal, and which might devastate every State that borders this great chain of lakes before it would be possible for the National Government to come in and protect them.

Now, this may be extravagant, but you may remember that from here north are her possessions; that she owns the mouth of the St. Lawrence. You may remember that she has on the Pacific Ocean a vast fleet of commercial ships. You may remember that she has in India millions of as good troops as ever faced an enemy in the field of battle. And you may remember that vast area of shipping that she can plant in six weeks on the western shores of this continent, and that in her own possessions she could plant at least one hundred ships to defend her Welland Canal. With her fourteen feet of water and her possession of the mouth of the St. Lawrence, through the Welland Canal to the great chain of lakes, she might devastate every city on those lakes before it could be possible, with our weak means of defense, to stop it.

Nations, like men, do not live altogether for their own time. They live for the generations that are to come. Sir, this nation is yet in its infancy. It is to go on, I believe, in the glory and providence of God, until it is one of the most wonderful nations, as it is to-day, on the face of the earth, and the time shall come when this National Government shall have her Army and her Navy that shall be as great in her defensive as well as her commercial glory, until she is irresistible.

Now, while all this may not be germane to this matter now before us, I do insist that the National Government has a material interest in this thing. She has planted in the region of Troy a national arsenal and gun factory. She has planted a gun foundry there which is to furnish the guns for the Army, while the other branch of the service is provided for by a national foundry at Washington. In doing this the National Government very likely had the thought of protecting these plants when they take care of the improvements of its rivers. The Watervliet Arsenal alone has rendered such incalculable service to the country that it is worth ten times more to it than it would cost to make this contemplated improvement of the Hudson River. That arsenal is planted on the west side of the Hudson River, on the opposite side of Troy, and it is of the first importance that the country itself should have the means of communicating with it by large ships for the purpose of taking away to the forts on the Atlantic coast and to other quarters the material which is there produced for the defense of the United States. You may not know, sir, that in one single discovery at this arsenal here the small arms of the whole world were revolutionized, because it was there that the percussion cap, which served so very well through a series of wars, was invented. During the time of the Mexican war that arsenal furnished vast supplies for that struggle. During our last war with the South it is incal-

› the amount of material and war material that was produced for the Na-
Government. Now, sir, this National Government can not jump in a
› into the giant proportions which it is to assume as a defensive force in the
. It must go step by step, and it is one of the things which the Govern-
must come to consider, whether in the ultimate future—it may be twenty-five
years—the water ways of the Hudson River must not be extended for ves-
war to connect with the great chain of lakes. The Government itself has al-
entered upon this work of connecting the Mississippi with the chain of
hrough its appropriations already made, and the work is now in progress.
›w we are simply confronted with the question of building for commercial
ıes. The commercial flag always precedes the efforts which the Govern-
nakes for resistance and defense.
I not intend to occupy the time of this body so long, but I do say that any
made by this honored Board which does not look to the entire future of the
y and the necessity of a free communication that shall extend from the
n River to the chain of lakes will be incomplete in its suggestive features,
ll fail to impress the whole country, which is looking to the needs of the
as well as those of to-day.
I beg you to consider the needs of this Watervliet Arsenal and the neces-
enabling products to come direct from the chain of lakes to the Atlantic
rd. I beg you will consider this question in all its breadth and in all its
I think that all who are assembled here to-day from whatever parts of the
y, and especially the instigators, will see that whenever the National Gov-
nt chooses to enter upon this large work the State of New York will not be
lhand. She has already made these canals free, but she holds possession
She pays in a single year as much money as the National Government has
ppropriated for the whole care of the Hudson River, and when this ques-
ımes to be reached, as come it will in the future, I think you will find the
›f New York prepared to pay its full share; possibly to build everywhere
› connect with the lakes, and have a ship canal around the Falls of Niagara.
things are coming. These things are being built for the future. We are
ıg for the future, for we do not expect to live to see all these things.
ıtever of money, whatever of influence, whatever of power is gathered here
for ourselves, but for those who are to succeed us, and I assure you, sir,
ıtions should look prudently to the future and build on that basis.

S. A. THOMPSON.

[Secretary of the Chamber of Commerce of Duluth, Minn.]

Chairman and gentlemen, I am here to speak directly for the Cham-
Commerce of Duluth, and indirectly also as the representative of the people
rge portion of the West and Northwest whose interests are bound up with
nd I have come to speak in favor of this proposed improvement of the Hud-
ver, because we are fully convinced that the cheap transportation furnished
waterway, of which this noble river is a part is the chief corner stone of
esent prosperity, and the only sure foundation on which to base our hope
lief that that prosperity is to endure and be increased.
Hudson being an integral portion of the waterway which connects the
Lakes and the sea through United States territory, any improvement therein
by navigation is made easier or safer, or the cost of transportation is les-
›n account of the greater draft of the vessels which can use it, is, there-
› longer a matter of merely local concern. An improvement of the Hudson
will allow ocean vessels to come to Albany will no doubt be greatly to the
ıage of Albany, but the beneficial effects of that improvement will not be
›d by any means to this city, nor to the State of New York, nor even to the
›n the Great Lakes from Oswego and Buffalo to Chicago and Duluth. Di-
or indirectly, in greater or less degree, the proposed improvement, and
improvement made at any point in this waterway, as has been so well said
retary Windom, affects the business and the prosperity of every commu-
ıd every individual from New York City to the foothills of the Rocky
ains and from the Great Lakes and the Canadian boundary to the Gulf
on the south.
time which can be allowed to each person at this hearing is necessarily
›rt to allow any extended argument, and I will, therefore, confine myself,
few minutes at my disposal, to as brief a statement as possible of some facts

which seem to me to have a bearing on the question under consideration, and some conclusions which seem to be warranted by those facts.

Some ten or twelve years ago two gentlemen, both of them railway presidents, one of an Eastern, the other of a Western road, sat talking together, and the conversation turned upon the continually increasing efficiency and decreasing cost of railway transportation, owing to the reduction of grades, the lessening of curves, and the building of more powerful engines and of cars which carried a much greater amount of paying freight in proportion to dead weight than formerly. The Eastern man stated that canal boats were about played out, and that river steamers were about ready to follow the canal boats into permanent retirement, and expressed the opinion that it was only a question of time when the steamships would also be driven from the Great Lakes, leaving to the railways an undisputed monopoly of the carrying trade of the continent.

It is exceedingly interesting to note the successive reductions which have been made in railway freight rates, for, according to Poor's Manual, the average rate per ton per mile received by all the railways in the United States, which in 1882 was 1.236 cents, had fallen in 1889 to 0.976 cent, a reduction of 22 per cent in eight years. Standing alone these figures would seem to justify the prediction of the railway president, but he forgot that it was possible to increase the efficiency of steamships as well as of railways. I have here a table compiled from the reports of the Chicago Board of Trade, showing the average charges for carrying a bushel of wheat from Chicago to New York for each year from 1868 to 1885, and by each of the three possible methods, viz, all rail, lake and rail, and lake, canal, and Hudson River:

Calendar years.	Lake and canal.*	Lake and rail.	All rail.	Calendar years.	Lake and canal.*	Lake and rail.	All rail.
1868	25.3	29.0	42.6	1877	7.5	15.8	20.1
1869	24.1	25.0	35.1	1878	10.1	11.4	17.7
1870	17.5	22.0	33.3	1879	13.0	13.3	17.2
1871	21.6	25.0	31.0	1880	13.2	15.7	18.7
1872	26.6	28.0	33.5	1881	8.6	10.4	14.4
1873	19.2	26.9	33.2	1882	8.7	10.9	14.6
1874	14.2	16.9	28.7	1883	8.40	11.5	16.5
1875	11.4	14.6	24.1	1884	6.59	9.9	12.2
1876	9.7	11.8	16.5	1885	4.55	9.06	14.0

*Including Buffalo charges and tolls.

From this table it appears that the all-rail rate has fallen in that time from 42.6 cents to 14 cents per bushel, while the all-water rate has dropped from 25.3 cents to 4.55 cents per bushel. That is to say, freight rates by rail have been reduced in the period covered by the table until the last price named is only one-third that first mentioned, but during the same time the all-water rate has been reduced to less than one-fifth of the rate first named. And more than that, the water rate has always been below the rail rate by a percentage ranging from 25 to 67.5.

From the careful records kept at the St. Marys Falls Canal it appears that the average price per ton per mile received by the vessels engaged in the carrying trade of Lake Superior was, in 1889, 0.15 cent; the total amount moved was 7,516,022 tons, and it was carried an average distance of 790.4 miles. The average rate on all the railways in the United States in the same year was 0.976 cent, or more than six times as much. In other words, to move the same amount of freight the same distance by rail would have cost in round numbers $50,000,000 more than it did cost to move it by water. Wheat has been carried from Chicago to Buffalo for 1 cent per bushel, or 0.04 cent per ton per mile, and thousands of tons of coal have been carried from Buffalo to Duluth at 25 cents per ton, or 0.025 cent per ton per mile.

These are prices charged. If we investigate the actual cost of freight movement by rail and by water we shall find some figures which are almost startling. Careful experiments conducted for a long period on the Grand Trunk Railway showed the actual cost of moving freight, exclusive of fixed charges, to be 0.5 cent per ton per mile. The average cost on all the roads reporting to the Interstate Commerce Commission for the fiscal year ending June 30, 1890, was nearly 20 per cent greater, being 0.593 cent per ton per mile, while the lowest cost I have been able to find on record is in the case of the Lake Shore and Michigan Southern, which has been able in exceptionally favorable years to report a cost as low as 0.4 cent per ton per mile.

The Western railway president above mentioned related sometime ago the incident of his conversation with the president of the eastern railway and added: "I might have continued to share his belief in the ultimate triumph of the railway over the steamship if I had not had occasion to build and operate a line of steamships myself. These boats carry 2,700 tons of freight on the present depth of water at the Sault, and make the run from Duluth to Buffalo in three days and a half, and cost an average of $120 per day." Calling the distance from Duluth to Buffalo 1,000 miles, and we find these figures are equivalent to .015 cent per ton mile, only one-twenty-sixth the cost on the Lake Shore road. Or to express the same fact in terms which will be more readily understood by the average business man, it cost $26 on the most favorably situated railroad in the United States to do what is done on the Great Lakes for $1. These apparently disconnected figures are, in reality, very closely related, and I have set them in array as a support to my first conclusion, viz: That under existing conditions it is utterly impossible for railways to carry freight as cheaply as it can be carried by water.

The Erie Canal was at first built to accommodate boats of about 80 tons. Its enlargement to accommodate boats of 210 tons effected a reduction of 50 per cent in freights.

A study of the reports of the New York canal board shows that the actual cost of freight movement on the Erie Canal at present is about .2 cent per ton mile, only half as much as the lowest rail rate, while, as we have seen above, the cost in lake steamships is but one-twenty-sixth of that rate. Ocean freights are still less; hence my second conclusion is, that the cost of water transportation decreases as the size of the carrier increases.

On roads subject to water competition freight rates invaribly go up when navigation closes in the fall and go down again when navigation reopens in the spring. A study of the statistics in Poor's Manual or the report of the Interstate Commerce Commission shows that the lowest rates are found on roads most subject to water competition. Take, for instance, the Lake Shore and Michigan Southern with its average rate of .653 cent and the Michigan Central with .726 cent per ton mile and compare these rates with those on the Chicago, Milwaukee and St. Paul, and Chicago and Northwestern roads, which were 1.06 and 1.03, respectively. My third conclusion, therefore, is that water ways are the most potent possible regulators of railway rates

It should be noted, also, that the influence of water competition extends far beyond the roads which lie nearest to the water way. The Lake Shore and New York Central, for instance, considered as one, are compelled to make rates under the influence of a water way which extends all the way from Chicago to New York. The Pennsylvania Central, away to the south, can not charge more than the New York Central, or the latter road would get the business; and so it goes. Nor is the influence of the water way confined entirely to the season of navigation. Mr. Albert Fink testified before the Senate Select Committee on Interstate Commerce that, so far as grain was concerned, this influence extended throughout the winter, for if the rates were made too high the grain was simply stored to await the drop in rates which was certain to come when navigation was again opened.

Supposing, then, for the moment, that other things are to remain as they are, the Duluth Chamber of Commerce favors the proposed improvement because it will make the city of Albany an ocean port and will increase the prosperity of her manufacturers, her mechanics, her wholesalers, her merchants, and citizens generally, thus adding to the prosperity of our common country.

We favor it because established lines of communication, both rail and water, so radiate from this city that a large territory tributary thereto will share in the benefits mentioned.

We favor it because it strengthens the great through line of water transportation on which depends the prosperity of our own city and of all the great region of which Duluth is the nearest lake port. We favor it because it will be, in connection with things as they now are, a direct, positive, appreciable benefit to us.

But most of all, we favor it because we do not want things to remain as they are, and we believe that this improvement when made will help to change them. The figures I have given as the net cost of water transportation on the Great Lakes are the results which have been attained on a draft of 15 feet. The appropriation is made, and the work is now in progress which will give a depth of 20 feet through the St. Marys River instead of 15. Twenty feet of water at the Sault necessarily implies a corresponding improvement of the channel through the St. Clair flats. Speaking to a convention called in the interest of the water ways, Mr. Jas. J. Hill, of the Great Northern road, the Western railway president

to whom I have before referred, said: "The Government engineers propose to give us 20 feet of water. We shall accept the 20 feet, and use it when we get it, but I promise you that whenever they will guarantee me 18 feet, I will build a line of boats that will carry 6,000 tons instead of 3,000, which is now the limit, and cut the present cost of lake transportation square in two."

If he can build vessels of 6,000 tons burden on 18 feet of water, I should suppose that 20 feet would make possible boats that would carry 8,000, perhaps even 10,000 tons by the use of very full lines and twin screws. But no matter about that. Vessels carrying 5,000 or 6,000 tons will do well enough, and judging from the figures we have found for vessels carrying 2,700 tons, one will need some kind of a financial microscope in order to be able to see the ton mile rate for vessels twice the size. These are not wild dreams, but certainties of the near future, and do you suppose, gentlemen, when vessels of that class can come up the Hudson as far as Albany, and come east on the lakes as far as Buffalo, that we shall long rest content with a 6-foot ditch between? I tell you no. One of the first things we shall probably call for is the building of the ship canal around Niagara Falls, not because we love Buffalo less, nor Oswego more, but because we love ourselves so much. We want to shorten the distance that separates the steamship on the Great Lakes from the steamship that comes up the Hudson from the sea, and we do not intend to stop shortening that distance until we have shortened it clean out of existence, and our steamships of 5,000 tons can sail unhindered from any port on the Great Lakes to any part of the world. If you begin to count the cost and say "impossible," we answer, "it is a necessity, and necessities are never impossible." When I say "we," I speak no longer for Duluth alone, but as a representative of the mighty commerce of the lakes. And I use that word "mighty" advisedly. I have not the figures at hand for the tonnage passing through the Suez Canal in 1890, but in 1889 the tonnage passing through the Sault Canal, away in the center of the continent, exceeded that passing through the Suez by nearly three-quarters of a million tons, a fact that every American ought to know, and which I for one am proud of.

Sault	7,516,02
Suez	6,783,15
	732,83

And the Sault was only open two hundred and thirty-four days, while the Suez was open the entire year.

The tonnage through the Sault in 1890 increased to 9,041,213 tons, which is almost exactly the same as the combined tonnage entries of New York, Philadelphia, and Boston for the fiscal year 1889-'90 (9,073,690). These figures, however, great as they are, represent only the business of Lake Superior. The tonnage passing through the Detriot River in 1889 amounted to 36,203,606, nearly 10,000,000 tons more than the combined entries and clearances of all the seaports of the United States, from Quoddy Head around to Puget Sound, and 3,000,000 tons greater than the combined coastwise and foreign shipping of Liverpool and London.

All United States seaports		26,983,315
London	19,245,417	
Liverpool	14,175,200	
Both		33,420,617

Such a commerce as that, Mr. Chairman, has a right to speak, and when it speaks, it is entitled to be heard. Speaking, then, as a representative of this mighty commerce, I say that a direct outlet to the sea is a necessity, and that we shall have it, sooner or later, by one route or another, is a certainty. All possible routes through United States territory converge at Albany, and the nature of the report which you gentlemen shall make, will have an important bearing on the question whether that route shall lie entirely in our own territory, available alike in peace or war, adding in the one case to our prosperity, and making certain our protection in the other, or whether it shall lie through Canadian waters. As for the people of Duluth, whether considered in relation to the present benefits, or the prospective changes which it will help to bring, we are unreservedly in favor of the deepening of the Hudson River.

GEO. S COLEMAN.

[Assistant to the counsel to the corporation of the city of New York.]

fr. Chairman and gentlemen, I appear to-day as the representative of the yor of the city of New York, who is unable to attend personally, and through mayor as the representative of the people of the city of New York. I do not an by this, the corporations alone, or the Chamber of Commerce, or the Boards Trade, or the men of wealth, but I mean the people as a whole—the people om the chief magistrate of the city of New York represents.

understand the question under consideration here to be a Federal one—one olving the greatest good of the greatest number. If for a time the contemted improvement of this great Hudson River should injure the interests of cer- people in the city of New York, it can not be questioned that it will ultitely be a benefit to the people of the city. The State has for some years past n endeavoring to protect the sources of this noble river by taking measures to serve the Adirondack forests from destruction. If it is worth while for the te to appoint a commission for this purpose so as to enable the river to live, re is but one step further, and that step the Federal Government can take by lening and deepening the channel of that river. The United States Governnt is at present engaged in widening the Harlem River channel. Improved ilities for navigation we can not get too much of. The city of New York has n spoken of as a place where it is difficult for a vessel to enter and be accomdated. That may be true to a certain extent. The city's rights with respect the water front have been, and still are, involved in litigation; but when those hts shall have been finally determined, you may depend upon it, that every t of Manhattan Island (which, unfortunately, is limited in its extent), every sible foot of water front, will be made available for the commerce of the Em- e State; for it can not be denied that New York is the Empire State, or that city of New York is the empress of American cities. We are in favor of s movement, for anything that tends to improve the commerce of the United tes and the State of New York will be reflected in the increased prosperity of people of New York City. You cheapen the food products and the building terials that come into that city, and you can not help but advance the interests the population as a whole. If there is anything in this improvement which y conflict with the interests of corporations, they will undoubtedly have an portunity of speaking to the Congress of the country. The State of Pennsylnia has recently adopted plans which will improve the roads of that great State, l our own governor has tried in many ways in recent years to encourage the provement of the roads in the State of New York. That is but another step this same direction. We can not do too much to improve our means of comnication or facilities for transportation.

While not attempting in any way to represent the great bodies in the city of w York, whose interests would be most likely to be affected by this project, speaking for the people as a community, I say that whatever will help this te and the people of the West must in every way result in the ultimate adncement of the city of New York, and can not help but be of great advantage to the people who live in the towns and cities that surround it.

There is one point which has not been touched upon by other speakers. By restion of Congress you are called upon to report when this improvement should gin. The facts that are given by gentlemen who come here with statistics ow that this work would be useful, and the figures demonstrate the relative lues of water ways, but the third point on which you are called upon to report the advisability of beginning the improvement at the present time. The restion speaks of "obstructions to navigation." It implies that there is someng in the way. And I say in behalf of the city of New York that the sooner obstacle is removed, the better for all the interests concerned.

T. A. JOHNSON.

[Of Glens Falls, New York.]

Mr. Chairman and gentlemen of the Commission, in common with the citizens Glens Falls with whom I am visting here to-day, I am unwilling to take up ur time by the presentation of any argument, or by attempting to add to the ts and figures which have been so ably presented. Our object in accepting invitation to come here is to add, by our presence, to the local interest

which is felt in this proposed national improvement, for it emphatically will be a national improvement. We come from that section of this great State that has a great deal to do, in its locality, with furnishing the water for this river, and without the water it would not be worth much for any purpose. We are at the gateway of the Ticonderogas, to which the gentleman who has just taken his seat has made reference in his remarks about the preservation of the forests and the preservation of the water supply. I think I am warranted in saying for all the gentlemen who surround me from our own village, some 50 or 60 miles north of here, that I only speak the sentiment of the entire business part of our village when I say that we are, from first to last, emphatically in favor of this proposed improvement. It seems to me that as an humble citizen of this State and nation that the benefits to acrue from such an improvement as this can hardly be over estimated or overstated.

I am glad that I came here, for a great many reasons; particularly, that I am able to look at such a representation from such a large portion of this State. I am very glad that I have been able to hear so many able letters and papers read and very glad that I am able to look upon and hear from the grand old man from Troy. I have heard a great deal about Troy all my life. I was born on the Hudson River and have always lived there, and I have always said, that no matter what was got up, good, bad, or indifferent, that was claimed for anything, Troy put in the first claim afterward. I once heard about a man who died and was transported to Paradise. After being around a good deal, he felt rather gloomy, and said he felt homesick and wanted to get back to Troy.

It seems to me that every business interest of every man from every section, not even confined to this State, is to be favorably affected by this proposed improvement of the Hudson River, which is at once our pride and our boast. It should command the heartiest support of every citizen of this great and free Republic, and I believe, as was said by the gentleman from Troy, that if this thing is presented as it ought to be, and I believe it will be no trouble in getting a favorable report from the Committee on Rivers and Harbors of the House of Representatives, and I look forward to the time—perhaps not in my day—when this waterway is deepened as proposed, and when these ocean vessels can come up this magnificent highway of commerce and shall here receive their loads of grain and everything else that is brought from the great West and the North, with Troy and Albany combined, sitting here at the head of navigation as the queen of the feast; and I may add, I wish that Mr. Townsend may be spared to be the presiding officer and magistrate of the combined cities.

Col. GILLESPIE. The meeting will now (1:20 p. m.) take an adjournment for one hour.

JOHN F. LAPE.

[Representing the citizens of Greenbush, N. Y.]

Gentlemen, for over nineteen months I have worked almost incessantly for the Hudson River ship canal. I have prepared a paper which I will have my colleague, Mr. Chauncey, read:

The address is as follows:

Gentlemen, the Hudson River is the nation's great highway between the seaboard and the extensive and productive lake region of the West, Northwest, and central Canada, and with the Erie Canal, it regulates freight rates as far as the Dakotas. As early as 1768 a passageway for boats was built between the Mohawk and Lake Ontario, through Wood Creek and Oneida Lake, and at that time Sir Henry Moore, colonial governor of New York, recommended the General Assembly to build a canal around the rapids of the Mohawk at Little Falls. In 1791–'92 the canal was built with five locks at Little Falls, another at German Flats, and another at Wood Creek, making a canal 7 miles long, and for which the sum of $400,000 was paid. Nothing further was done until 1807, when the canal question was revived by the Hon. Albert Gallatin, Secretary of the United States Treasury, who prepared an able state paper on the subject for the United States Senate. Secretary Gallatin advocated the joining of the Hudson River and Lake Ontario with a second canal. In 1809 De Witt Clinton was chosen one of a commission to survey a route from the Hudson to the Great Lakes of the West, and Buffalo was selected as the western terminus; but one delay followed another, and the war of 1812 postponed the measure until 1817, when a bill authorizing the construction of the Erie Canal was passed, and work on the great waterway to the West commenced. With the election of Clinton as governor, work was progressed, and the Erie Canal was declared finished on the 26th day

October, 1825; but no sooner was it declared finished and ready for traffic than enlargement was found necessary, and at an enormous expense this was accomplished in 1862.

Up to the present time the State of New York has expended something over $5,000,000 for construction, maintenance, and operation of the Erie and other canals throughout the State, and $1,431,429 for dredging, building dikes, and improving navigation on the upper Hudson, and the General Government has also expended up to 1879, a grand total of $1,350,000, for dikes and improvements, but since that time all work of any importance on the upper Hudson has been done by the State government.

In 1882 the people of New York State voted to throw its great water ways open, free to the commerce of the world, and the present average tonnage is 5,106,401 tons per annum, valued at $150,000,000. The total tonnage of the Hudson River between Troy and New York is not far from 18,500,000 tons per annum, a considerable more than twice as much as the great Mississippi, and seven or eight times as much as the Missouri and Ohio rivers. With the development of the Northwest, the commerce of the Great Lakes has grown to wonderful proportions, but what has been is as nothing compared with what the next score of years will show. More tons of freight pass through the Detroit River each year than the total exports and imports of the United States. In 1887 the ore output from the superior regions amounted to 4,700,000 tons; this year the total will be about 5,500,000 tons. In 1889, Chicago, Milwaukee, West Superior, and Duluth shipped to Buffalo more than 34,887,000 bushels of wheat, and this year the grain fleet on its first trip brought down 110,000 tons of wheat, corn, oats, rye, and flaxseed. The trade of ore and grain forms only a portion of the great traffic of the lakes. The Canadian commerce adjoining the western lakes is only in the first stage of development. A competent American authority has stated that Canada posesses two-thirds of the wheat-producing area of this continent. An examination of a section between the Rocky Mountains and Hudson Bay, covering 1,260,000 square miles, shows that 860,000 square miles are fit for settlement and adapted to the raising of potatoes, barley, and wheat.

This immense territory also contains inexhaustible deposits of silver, iron, graphite, ocher, brick and pottery clay, mica, gypsum, lime, and sandstone, while the petroleum area is so extensive as to justify the belief that eventually it will supply not only the larger part of North America, but many foreign countries.

Less than 10 per cent of the Great Lake traffic is in Canadian vessels, or in other words, *on all the lakes the stars and stripes float supreme*, and here in winter can frequently be seen larger fleets under the American flag than in any ocean port. The nearer a steamship can be brought to the Great Lakes, the better it will be for the surrounding country for hundreds of miles.

In this age of competition, every enlightened country is holding fast to its industries and commerce, and with the deepening of the Hudson, we simply propose to bring Buffalo and the great western country 150 miles closer to the seaboard. With a ship channel to Troy, the western shipper would not only effect a saving of 300 miles of towing to and from New York, but would be able to make at least six or eight additional trips from Buffalo to West Troy every season. At present it takes ten steam canal boats to transport 2,400 tons of grain from West Troy to New York City, and each of these canal boats will consume forty hours to make the passage, which gives us a grand total of seventeen days less eight hours, and seven or eight of these boats will return to Buffalo without earning one dollar, consequently the home-bound passage will consume all the profits made with the cargo.

A steamship would come from New York to West Troy in ten hours, receive a cargo in ten hours, return to New York in ten hours, and be 150 miles at sea before the steam canal boats had covered the distance from West Troy to New York and made fast to the dock at the latter place with its 240 tons of wheat.

The Hudson River is and will always remain an arm of the Atlantic Ocean, and no matter how deep it may be dredged its present level can never be lowered. No locks or artificial supply of water will be needed to keep the channel free from sand bars and other obstructions—*the deeper the channel, the better*—as sand bars form only in shallow places. With a great body of deep water passing through the channel, all sediment and mud at the bottom is scoured away, and a uniform depth is maintained.

When the St. Lawrence ship channel was excavated through Lake St. Peter, a few miles below Montreal, the most experienced pilots of that day said it would be immediately filled with the shifting sand at the sides and bottom, but investigation and sounding after the expiration of seven years proved that it had actually

grown deeper. The project met with no further opposition, and the great work was successfully completed, which made Montreal, though situated 1,000 miles from the Atlantic Ocean, a grand commercial city. If the commerce of the Great Lakes and the Hudson is not to be considered, then there is another good and substantial reason why the river should have a ship channel.

The Government has just established a gun foundry at West Troy on the grounds of the Watervliet Arsenal, and to equip war vessels with the heavy carriages and guns which it is intended to construct at that plant it will be necessary for the war vessels and battle ship to reach the docks of the Government works.

No ordinary railway bridge would sustain the weight of the largest gun, and besides, the expense of transporting them by rail, unloading, and placing them on board the war ships would soon exhaust more funds than is required to construct the proposed ship channel from Hudson to the State dam at Troy. But with the enormous commerce of the Great Lakes, and with the entire Northern, Western, and Northwestern country asking for more rapid and cheaper transportation to the seaboard, it becomes the duty of the Federal Government to make the Hudson River what nature intended it should be—the chief and natural water route to the great and growing West.

HON. H. G. BURLEIGH.

[Of Whitehall, N. Y.]

Gentlemen, it is a well-known fact in my Congressional district that it is usual to speak of Mr. Townsend and Col. McArthur, notwithstanding that we live in a modern age, as the "Heroes of Troy."

The only difficulty in the way of improving the waterways of this State and the transportation facilities of the West is the State of New York itself. Mr. Youngman referred to Mr. Windom's report. I believe that in the year 1873 the United States Senate appointed a committee on the best transportation routes from the West to the sea. Senator Conkling and Senator Sherman were on that committee, and they brought the attention of this country to the fast growing commerce of the West. There is no doubt, if Great Britain owned the State of New York, that we would have water ways to the West. Millions of money have been spent for the commerce of the Argentine Republic alone, which is so much less than the commerce of the West. The gentleman from Duluth who spoke so ably here, said he had been told by one of the prominent men of the West, Mr. Hill, that the wheat-growing section of the Northwest was something fabulous, and that they were going to have an outlet. The vast improvements in steamboats and the present methods of transportation are equal to the improvements of the railroad system. The metropolitan press, in speaking of our canal system, have created the impression adverse to it, and they have done so persistently for the last year, and the New York Tribune spoke of a deficit in the canal system of several millions.

Now, what is that deficit? $4,000,000 were loaned to the Erie road; $3,000,000 to the salt works, and to the State prisons of this State $200,000, and that to-day stands for the canal system of this State. They were not got to pay the expenses of the Government, nor the debt of the Erie road. When I was chairman of the canals committee in 1875 I investigated the matter thoroughly, and the expense of maintaining the water ways of the State to-day is not one-half what it is to maintain the capitol on the hill.

All that you have got to do to-day to get this matter through is to go to Washington, and the Northwest represented there will meet you. The very able chairman of the River and Harbor Committee is willing to improve the facilities that exist in the water ways of the West, and most every one, even the Southern members, appreciate the value of the transportation routes by way of the Western lakes and the Hudson River. The gentlemen that come down from Lake Champlain and are here to-day illustrate how every man in the Lake Champlain valley is in favor of this great movement, and if the city of Albany will meet this question there is no doubt but what it will be accomplished. The gentleman from Troy, Mr. Townsend, omitted to speak of the Hudson River further up. Do we realize the extent of the Canadian rivers tributary to this great Champlain valley? There are only two great valleys—the Champlain region and the Oswego valley, and it is fully time that the State of New York moved up to the importance of the question. The water ways have not received the attention they are entitled to. One hundred thousand men of this State are employed on the Great Lakes, and millions of dollars are invested in canal boats. One mil-

ion, four hundred thousand tons come down the Champlain Canal. Nearly ,600,000 tons are put upon canal boats that have a draft of 4 feet of water.

Now, if the Hudson River were improved to Fort Edward this canal would astly improve the great trade which now exists in the North, and I wish to call he attention of this board in making their report that I think there should be survey through to Fort Edward on the Hudson River.

Let me call your attention to another fact. Ten million tons of iron ore are roduced in the United States. Lake Champlain produces one-tenth of it. It is apable of producing one-third of the entire ore of this country.

I tell you that the northern part of this State is ready and willing to help you n this matter. Talk about the expense of maintenance. What is the expense? t is about 18 cents on the $100. It is a mere nothing. No other country on this earth would permit its water ways, especially such a one as this magnificent Hudson River, to remain unimproved. Even Spain or Mexico, if they had these vast water ways, would feel themselves disgraced at the care and protection that is given to them.

[H. B. SILLIMAN.

[Of Cohoes, N. Y.]

Mr. Chairman, after what has been said, and so well said, as to this measure, what I have to say with reference to the peculiar locality which I have been called upon to represent I have sometimes thought might be unsaid.

I come from a city 3 miles above Troy. Both the southern boundary of the city of Cohoes and the northern boundary line of the city of Troy, if extended, would nearly coincide. It is a manufacturing place entirely. The facilities which it possesses for this purpose we consider almost unequaled. The topography of the place is, allow me briefly to state, as follows: We lie for a mile and a half on the Hudson River which is above Troy. On the northern boundary of the city is the Mohawk River, having within the boundaries of the city or within its lines about 140 feet flow, over half of which is available for hydraulic purposes for manufacturing. The formation of the space is such that this power can be used to the greatest advantage to the series of parallel canals arising from one into the other, giving, as now proposed, a possibility of enlargement—a series of canals each one about 22 feet head and fall. In other words, we have there at the lowest stage of the water at the Mohawk 10,000 horse power, which, being supplemented by steam, can be extended many fold.

In speaking of the capacities of this place, I am not doing it for the purpose of advertising Cohoes, but as an illustration of a principle which I shall presently speak of.

We have one cotton mill there which uses 30,000 bales of cotton per year, making 80,000,000 yards of cloth, using 4,000 tons of coal per year, and making a tonnage in a year of 20,000 tons. We have about thirty knitting mills, having, as will be understood by persons who are acquainted with that style of manufacture, 240 sets, producing 1,300 dozen of underwear of shirts and drawers per year, or 15,600 of these garments. The tonnage from this is equal to 25,600 tons.

This is germane to the subject under consideration to some extent. I will not present the claims of Cohoes and its interest in this project in the same line as was offered in the case of Troy to-day, by including the cities and villages within 5 miles of us. This with the 25,000 people that live within our limits would give us 125,000, who are all more or less interested in manufacturing. That would have very little interest for this committee; but I present the subject as a new phase of thought, it seems to me, because I am surprised that neither from Troy or Albany has there been any presentation of the local industries of the place, and yet in this valley from Albany to Cohoes there are scores of thousands of people engaged in manufacturing—active producers of value, who give value to raw products, the greater part of which consists in the labor that is given to them. They are the people who take a pound of cotton and from it make 4 yards of cotton cloth that are sent to the markets of the world, and which represents not only the raw cotton that has gone through there, but the toil and labor of a great many men. Such an industry is a well-recognized part of commerce. Perhaps I may be charged with being selfish when speaking of the industries of Cohoes, but that is a feature that is not ignored in the passage of other bills—the river and harbor bills, for instance, where the benefit to localities is always taken into consideration. Why not here? Why not, if you find in Troy one establishment employing 135 men, not women and children, but stalwart men, engaged in turning out the products of iron. And there are thousands and thousands

of others. Although Cohoes may be a small thing, I say that it serves as an illustration of the manufacturing interests in this part of the State of New York, in regard to this proposed improvement. It is well that we should look with enlarged view upon the demands that are made of us as citizens of the State of New York, and above all, as citizens of the United States, by furnishing a water way that shall extend from the harbor of New York to the great chain of lakes on the West, and that we should be able to see vessels coming up in one grand procession that shall lead the world. But we don't want to sit idly by on the banks of that stream and look at those overflowing products. While these streams of wheat and corn are running by us, what are we going to do with our water power, where the water goes on and flows forever, containing the elements of prosperity. It will not do for us to neglect these things—industries that are such an important part of this country. Cohoes is a little place in comparison with other places, but remember that around it and its 25,000 people the armies of Washington, Rensselaer, and Saratoga are bringing in, not corn and wheat, but other things that are very important to the country. That is something that is worthy of being considered. Not only the commercial interests are to be regarded, but the manufacturing interests as well.

I wish that I had the statistics to present to you of the manufacturing interest of our locality—not only in the tonnage that it gives to the Hudson River, but in regard to the market which it affords and the benefit which accrues to the surrounding country, reaching I do not know how far. God hasten the time when we shall see ocean steamers anchored in front of the streets of Troy and the streets of Cohoes also. I should ask the committee to go 3 or 4 miles further and reach Cohoes and Waterford, at an insignificant additional expense, but I suppose that that is not within the resolution. I tell you, there is something coming into that stream besides ocean steamers. They are the small steamers and barges of these various means of transportation that are coming alongside of the ocean steamers. And not only in number but in value will they outweigh the ocean steamers. We can not tell the farmers of this State to sit on the banks of the canal and see the wheat and the corn going by them to the New York market, and say to them, "What a glorious thing this inland transportation is." It has been wisely said that every facility that is added to transportation adds to production. And it is true. The gentleman from Duluth said that every inch that you added to the water in depth adds to the facilities, and in that way everything is cheapened. The farmer will feel it. If Cohoes shall be afforded facilities for bringing cheap coal and ore to its banks, 1¼ miles long, then, I tell you, that 100,000 of her population will reach out their arms to gather in the varied products of the farmers of New York. She has the natural facilities for all this. But, remember, this is only an illustration. On the other side of the river, 5 or 6 miles, there is Waterford, and further up are to be found Syracuse and Rochester and others. All of us are to see these vessels going past us. But are we to receive our share? Oh, no. It has been said that the introduction of machinery would enable one man to do what was formerly done by three. The farmers here don't have the fruits of their labor. On the broad savannahs of the West they reap that advantage but what are we going to do, on the hills where this machinery can't come into play? It is an important market, that has got to be created to make up the wealth and prosperity of the State, and, therefore, I present this little city of Cohoes as an object lesson as to what is due to the farming and manufacturing interests; not only the factories around here, but those which reach into Vermont and New Hampshire, where they go into the mountains for the rich marble for the mansion and the statuary, which is to be taken to Lake Champlain and put into its vessels along this highway. Whose place is it to do all this? I will not enlarge in this regard. The State has done much. The State is willing to do much, but to the United States Government belongs also this duty.

Mr. Chairman, the rivers run toward the sea, but the sea is not yet full. Why? It is because the grand, glorious old sun, with his bright arms reaching down silently but powerfully, takes up that which the rivers and the streams have given and brings it back once more and disseminates it, giving peace and prosperity over the land, and so the eternal process from the Eternal God goes on, and will go on until the children of earth shall be no more. To me it seems that the General Government stands in relation to that power. Stream after stream, little rivulet and mighty river, are pouring their abundance into our national coffers. Let the National Government stand in the place of that grand power. Not with demonstration, not with force, but let it be like the sunlight—quiet, unfelt, unseen, but with almighty power, taking up the benefits and bringing them back until they shall be an all-pervading blessing, and give prosperity to the whole country.

WILLIAM E. CLEARY.

[President of the Canal-Boat Owners' Association of the State of New York.]

entleman, this call upon me is unexpected. I just arrived here a moment , to see what was being done, and had no intention of saying anything to this mittee. There are gentlemen here from all parts of the State who could abunly lay the case before you a great deal better than I could, but having been ed upon to represent the Canal-Boat Owners' Association, I suppose I can not etter than to agree in all that Mr. Burleigh of Whitehall has said.

seems that the water ways of this country are not developed entirely as they uld be. Mr. Burleigh mentioned one mattter that I might call your attention s a very pregnant point, that the State of New York seems to be to blame this. We have held canal conventions for the improvement of the canals, a great many of us have opposed United States governmental aid, believing t it would be too slow, and that the State itself would take hold of the thing ker and cause the immediate improvement of the water ways. But it seems t there must be a spirit of false economy and parsimony pervading the whole te, and that they will not spend the money for that which is necessary for the te, but are willing to spend it in decorations and in useless things that are not able of bringing the same prosperity to the State as the improvement of its er ways.

for one, am ready to join with you and to join with the people of the Northt. That is where the grain comes from, and the people out there need this er way fully as much as the people of the State of New York do. They are bably willing to dig out and enlarge the water way. That seems to be the st natural course, in order that their commerce may reach the seaboard as aply as possible, so that it may be laid down in other lands in competition h grain from other ports of the world. I think with the gentlemen, that the ted States could be engaged in no better business for the prosperity of its ple people, regardless of State lines, than in digging out and increasing the er facilities of the whole country.

herefore I may say, as representing the canal-boat men, that I am in favor of thing, or any method that will increase the water ways, deepen them, and e them capable of carrying more goods.

ow, to speak of the place where Mr. Burleigh came from—the Champlain ley. I own some barges that were built in Lake Champlain because labor was aper there than in New York and the surrounding country. I had them ught down to New York. They brought 150 tons all the way through. In w York Harbor those same boats carry 400 tons of soft coal from docks and de- r it alongside of ocean steamers. That is a good, fair illustration of what p water will do. These boats can only carry 150 tons through this little water , but that is owing to the lack of public spirit of the people, and to that false ument that originates with people who desire to be considered champions of farmers, but who are simply foolish advocates and injurious to the State.

hat is a good illustration of what may be done by deepening other streams. ure gave us the water way; man built the railroads. Wherever water comes ompetition with railroads for heavy freight, for unmanufactured articles, it hold its own, and it is just as beneficial and more so than the railroads. If re were such corporations as the New York Central or the Pennsylvania Raild in direct competition with the Erie and the Champlain canals, does any one pose that they would lie there neglected? Many efforts have been made by n in our business to induce the legislature to help matters. Men have come e to Albany to beg for appropriations to improve the water ways. What uld the cost amount to? As was said here, it would be about 18 cents on $100. h farm would have to pay about a dozen of eggs as its share of the money re- red. All the prosperity of New York and Brooklyn and all the other cities ans less taxation to the individual.

only call your attention to these facts to show you that we are worthy of re- ving this improvement from the Government, and hope that you gentlemen l recommend.

HON. WM. F. TEFFT.

[Of Whitehall, N. Y.]

lay it please the gentlemen of the Commission and gentlemen of this conven- n, I almost feel in attempting to prolong this discussion, that I should justify retort that was made to me in suggesting that the diet of the people of White- l was brass.

So much has been said in this discussion that it seems almost superfluous to attempt to say anything more or to touch upon any lines of argument or discussion that has not already been thoroughly exhausted.

There are two things, however, which I address to this Commission which have not been touched upon by any of the able gentlemen who have addressed it.

As I understood the work of this Commission as stated by the chairman, it was to ascertain and determine whether the aid of the United States Government should be invoked in the completion and working of this improvement of the navigation of the Hudson River. The point, therefore, which is to be argued before this committee probably is the consideration of whether this great work, which is conceded by all to be so important and so beneficial, should be undertaken at the expense of the United States Government instead of at the expense of the State; for the Hudson River, notwithstanding the burden of commerce which it bears to the sea, lies wholly, entirely, and exclusively within the State of New York. It would seem, therefore, at first sight, that whatever is to be done in the improvement of the navigation of the river, to increase its capacity, should be the work of the people of our own State, and that this improvement is a matter of unconcern and indifference to the people of other States in the great commonwealth of States which makes us a nation.

Now, the point we urge is that we are to justify this Commission in its report on this improvement in recommending to the General Government and to Congress an appropriation of money by the United States to improve the navigation of the channel of this river which is entirely within the borders of one State. I will say right here that the importance of the improvement which is projected is so great, that were it only to be done by the State government, and only by the State in whose borders it lies, that the people of that Commonwealth would be justified in expending all that would be necessary to complete the work projected.

The question, therefore, presents itself from a double aspect on this point alone. It is important to the State and it is important to the nation. Were this a convention composed entirely of citizens of the State of New York, and we were considering whether the finances of this State should be expended toward the perfection of this improvement, I could make an argument that would at least satisfy myself as to the sufficiency of its importance to justify the expenditure, by the State alone, of the large sum of money that would be necessary to perfect it. But we are considering the question of United States aid, and therefore we are to consider the question not as to its importance to the State alone, not as to its importance to localities alone, not for its benefits to the people of Albany and the people of Troy and the people of Cohoes, or to the people of the State all the way from Albany to Buffalo, but we are to consider whether it is of sufficient benefit and importance to the people of the entire nation to justify the expenditure by the Federal Government.

It has been suggested here very properly that, in view of the expenditures of the Federal Government, it was at first contemplated and understood that the commerce of the West to the East would be by the way of the Ohio and Mississippi rivers. And therefore the attention of the Federal Government to the improvement of navigation was directed to the improvement of those streams mainly. So great was the importance of the Mississippi River deemed to the people of the Northwest that it was used as a lever by the people of the South by which they would be enabled to compel the Northwest to join with them in their attempt to separate themselves from the United States Government. "For," they said, "the Mississippi River is the great avenue and the great outlet for your commerce, and therefore, as we hold the mouth of it, you must go with us so that your commerce can flow unvexed to the sea." The people of the Northwest said: "We can see all that you say in regard to the importance to us of the Mississippi River, and therefore we will force our way with bayonets to the mouth of the Mississippi River, and no power of Government, foreign or domestic, shall inferfere with the flow of the commerce of the Northwest to the Gulf." And so they kept their word, and the regiments of the great Northwest forced their way from the West to the Gulf with their lines of bayonets. The Mississippi River was indeed closed, but did it stop the flow of traffic and commerce from the West to the East because navigation was obstructed? No. It found another outlet, and then the importance of the canal system of the State of New York and this Hudson River, on whose banks we live, was demonstrated and revealed to the people of the Northwest, and they saw that their avenue of commerce was not the Ohio River, not the Mississippi River, but the system which terminates at New York City through the State of New York.

That was the beginning of the realization of the importance of the canal system of the State of New York and the Hudson River to the people and the commerce of the Northwest.

Now, then, what has been the result? Why, the result was that the transportation of cereals from the United States to Europe was then developed.

Do you realize within how comparatively a short time this great commerce which is so extensive and for which the figures have been given here has found its way through the State of New York and down the river to the harbor of New York and from there to the rest of the globe? It is all within thirty years—since 1860:

Now, then, what? The State of New York is brought into relations with the Northwest, as New Orleans was brought into relations with it previous to the war. And it is found that the commerce of the cereals of the West must find its outlets to the markets of the world through New York. These are the reasons, gentlemen of the Commission and gentlemen of the convention, why this improvement is a national concern. It does not affect the people of the State of New York alone. The commerce that flows through the Erie Canal and flows through the Hudson River, that comes from the Champlain Canal, and from every infinitesimal part of it, is through the State of New York. It is the products of the West and the Northwest that comes through our water ways which enables us to say to-day that the commerce which flows through the Hudson River is one-half greater than that of all the other rivers of the common country.

That is why this improvement is an international, an interstate, affair. That is why this Commission will be warranted in saying to the United States Government that this thing does not concern the State of New York alone. It concerns all the States of the West—Ohio, Indiana, Illinois, Wisconsin, Iowa, Minnesota, the Dakotas, and all the States which have recently come into the Union. It is to benefit them as well. It is to benefit every State through which and on whose borders this commerce is carried, and it is that which makes it of such national moment and concern.

Now, that is my first point. Understand me. It is because it develops and furnishes an outlet for the products of the great States of the West and of the Northwest.

Now, then, the affair goes beyond even the United States. It now becomes a matter of international importance. I said that it was within only thirty years, comparatively, that the cereals of the West and the Northwest have found a European market.

Gentlemen, what is the problem of the whole civilized world to-day? It is one which interests gentlemen of your profession. The whole engineering profession of the world is taxed to the uttermost to find new ways of communication, new means of transportation, to cheapen the products which feed mankind. It is for this that the Suez Canal was put through the Isthmus of Suez. It is the reason that the Nicaragua Canal is to be put in to connect the Gulf of Mexico with the Pacific Ocean. The object is to shorten the time of transportation and to cheapen transportation.

Let us see how that affects this question. First, we have natural water ways. We have the rivers and we have the little barges. There was a time when the communication between Staten Island and New York City was by the ferry boat of Commodore Vanderbilt. We have these natural water ways, and barges and boats and vessels that were propelled by hand. Then we had the canal and the small canal boat. Then we had the railway age. As has been stated to-day, the annual railroad mileage built all over the globe at the present time is in the neighborhood of 50,000 miles, and more than half of it is within the United States. We have, then, this mode of communication. Now what? We have to diminish the railroad communication if it is not cheap enough. Then, what is there to do? Transporting bulk. That was the argument in the statistics which were so ably and clearly presented by the gentleman from Duluth. When it was found that the transportation by the large lake craft, as compared with the railroad, was as one to twenty-six; that is to say, if you move the same bulk of traffic by the railroad it calls for twenty-six times as much as to move it by the large lake craft. That is where the problem is coming now. It is to have large water crafts, and that is why it is proposed to make the Hudson River an arm of the sea, so that these large crafts can come up from the city of New York to the city of Albany, or the city of Troy, or to whatever point it shall be deemed advisable by this Board to recommend to the Government.

Mr Welles states, in his series of articles in the Popular Science Monthly, that, when they first built the Suez Canal, they built in steamers of 1,000 tons

burden. In two years they put in vessels of 2,000 tons, and then vessels of 3,000 tons, and those are the vessels which to-day navigate the Suez Canal.

That is the problem. It is to extend these water ways out as far as possible, and to have as many as possible of these large water craft as can be navigated, to carry the products.

One gentleman said here: "What would Great Britain do if it owned this State?" What is Great Britain, or a portion of that island, doing now? It is building a ship canal from Liverpool to Manchester; spending millions of dollars to make a ship canal between those two cities that were already connected by water, and already, it would seem, sufficiently connected by rail. Why? To make that 30 miles of navigation navigable by ocean-going vessels. They thought they should not stop at Liverpool, but should go to Manchester.

How does that matter bear on the question before us? Here, again, comes in the figures of the gentleman from Duluth, or perhaps it was another gentleman who submitted a paper showing statements of facts as represented by the census at the present time. In what direction was the growth of the country to-day? He stated that it was in the neighborhood of the lakes. There we have it.

What, then, is the problem? It is to make your water communication where this growth of population is, and increase the production by making a continuous water way from the tail end of the lakes to the sea.

This improvement is one step in that direction.

Seventeen or eighteen years ago this winter, standing in my place in the assembly of this State, I asserted the prediction that the time would come when Duluth would be a larger point of grain distribution than Chicago. I have lived to see it. The statistics of the Chamber of Commerce of the city of Duluth show that more grain was, in the year of our Lord 1890, sent from Duluth than was sent from the city of Chicago.

Where is that grain-producing area going? Where is it developing? It is continually going to the northwest. It has gone out of Ohio, gone out of Illinois, gone out of Wisconsin, largely going out of Minnesota, and is going into the Dakotas, and into Wyoming; going, as one gentleman stated to-day, up to the Valley of the North, and up the Saskatchewan. Therefore, in any statements which may be made as to the grain-producing area of the United States, reference must be made to these facts. It is continually going to the northwest; going down the lakes; and the problem now is, to find the shortest way to get the grain from the lakes to the seaboard.

If you look at the map you can find that you can go through the lakes and go down the Oswego Canal, and so to Albany. It is a great step to bring the ocean up to Albany; your shortening your line of communication 150 miles and increasing the capacity of your craft. By and by the question will be, supposing this improvement to be consummated, whether you will go from Lake Ontario down to Albany with a ship canal, or whether you will go down the St. Lawrence, and come across the Lake Champlain, and so down the Champlain Valley. But whatever system is devised by which the grain-producing area of this country is to be connected with the Atlantic Ocean, it must be with some system that connects with the lakes. The engineering capacity of this country will speedily determine the easiest and cheapest, the most economical way of making that navigation; and when that time shall come, I, as a resident of the Champlain Valley, have no doubt where the line will be laid.

The first step, however, is this subject of improving the navigation of the Hudson River as far as Troy. And I now come to the second point which will be embraced in the report of this Commission—whether you should extend this proposed improvement to the city of Troy? I say by all means recommend that. The local commerce has already been explained, but it is necessary for the commerce of the Erie Canal to go to Troy in view of the further extension and development of this work in connection with the work which I have already suggested from the northern lakes.

There is still another consideration. I have said that the grain-exporting commerce of this country has developed within the last thirty years. That is true. And it has had such an effect on the growth of the West and the Northwest that it has excited the envy of all the nations of the earth. Not only that, but also the cheapness of our products, and of our transportation. The comparatively low cost at which a cargo of grain or flour can be transported from the Dakotas to England has led men to inquire whether it can be produced even cheaper in other places. What is the effect? Three men, as stated by Mr. Welles, can produce and lay down in Liverpool for less than the rental of the ground in England necessary to produce that amount of wheat. Other nations have seen

this, and they are moving heaven and earth to compete with this country to supply the grain market of Europe. Even Egypt is coming up out of the centuries of degradation to compete with our market. England has extended her railways into India to see if they can not produce wheat at a trifle less than can be done in the United States.

Reference has been made to the Argentine Republic. Capitalists of England have embarrassed themselves in loading up with the securities of that Republic, to see if they can not compete with the United States, and lessen the supply of wheat that is obtained from this country.

And so it is all over the globe. A difference of a quarter of a cent a bushel decides the source of supply of the food of the nations of Europe.

Now, having this thing in view, everything that diminishes the cost of transportation and of production, even to the most infinitesimal degree, is a matter of national importance, and it should be taken into account.

I need not refer the distinguished gentlemen of this Board to the engineering problems that are asked to be solved to shorten communication through the lakes. Reference has been made to the commerce of the Detroit River and the St. Clair Falls. There is now, and you gentlemen are more familiar with the fact than I am, and can tell me of it, rather than that I should suggest it to you, a system of ship railways whereby a large corner in the system of the Great Lakes is to be cut off. Everything is being done. I need not refer you to the ship railway that is being built in Nova Scotia so as to shorten the route and cheapen the cost of production. I only mention it so as to suggest to this convention how the minds of statesmen and engineers and the commercial men and the men of business of the whole world have been turned to the question of producing and transporting the products of the earth at the very minimum of cost.

Having these views in my mind, and having these facts and conclusions here, it seems to me criminal that this development should not be undertaken. I can not conceive of the tendency of the people of this country to antagonize works of internal improvement. I look at other nations and see them expending millions of money, tunneling the Alps and cutting down mountains and excavating isthmuses at narrow intervals to connect seas, and doing everything to hasten communication and cheapen production, and I see the people of this Empire State, a State of 5,000,000 inhabitants, sit supinely and view their water ways with indifference. Their advantages of situation are such that the stream of commerce can not go around them if they only develop it, and I tell you that in this age of engineering ability, nothing is impossible. The streams of commerce which flow to our borders from the remote corners of the West, which has so greatly enlarged, and which has made us so wealthy, can greatly be increased. From St. Johns in Nova Scotia, to Newport News, and to Savannah, every nerve is strained to get control of the magnificent commerce of the Northwest. Busy brains are plotting, and busy hands are engaged in the work of bringing the communication of the Northwest within their reach so as to control the production.

New York has hitherto been the Empire State, because it has been able to control its commerce. New York City has been the metropolis of this country, because of her harbor, and of her nearness to the sea. Do you realize, gentlemen, that there was a time in the history of this country when Newport was a larger city than New York? There was such a time, because Newport, on account of her harbor, and her communications, and her intercourse with the West Indies, and controlling a larger area than New York, was a larger city than New York, and bade fair to be a larger city than New York and Boston to-day. There was a time when Philadelphia was that.

Now, if you take the commerce of the Northwest by the Erie Canal; when you can take the commerce of Canada by the Champlain Canal; then you distribute the area of your rivals and become the metropolis of the western continent.

If New York would be the Empire State of the western continent, it must be because she can reach out her hands across the lakes and across the prairies to the grain fields of Dakota, and Minnesota, and Wyoming, and the Red River Valley of the North, and flux them and bring them within her borders. As soon as she can do this, she *will* be the Empire State. When she ceases to do this, her decline will have begun.

COL. FURMAN.

[Of Schenectady, N. Y.]

Mr. Chairman and gentleman of the Committee, I have just arrived here, and did not know that I would be called upon to speak, but the question before the committee is, what benefit is to be derived to the State by deepening the

Hudson River? Now, we are only to judge the future by the past. In the early days our fathers went to work and built this Erie Canal, connecting Lake Erie with the Hudson River. Up to that time, the country was in its infancy. There was no West, and when we built that Erie Canal it took the tide of emigration from the old West and planted it on the prairies. Illinois, Michigan, Indiana, and Ohio owe their early existence to the Erie Canal. We opened then a direct trade with the West by way of the Erie Canal to the Hudson, and by the Hudson to New York City. New York City, as a gentleman remarked a few moments ago, was comparatively a village to what it is now—the great metropolis of a great country. Upon the opening of that trade it came to New York; all the surplus cereals raised by the people on the prairies they sent it to New York, and received in return the merchandise of the New York merchants. In other words, they shipped their products here and were paid for them in merchandise. This increased trade did much to make the metropolis what she is to-day. At that time we were not a manufacturing locality, nor were we a wool-raising State.

We now stand out as the Empire State. Where do we get our immense revenue from? Why, much of it comes from the beautiful harbor of New York City through its great trade with the West, and this trade must certainly be increased by this work. I do not confine myself to any particular locality, but to my mind, to deepen the Hudson River will bring this increase about. The Government has done nothing for our canal. New York is indebted somewhat to the Erie Railroad and the New York Central Railroad coming down from the Pacific slope with its four steel tracks and bringing that great commerce from the Northwest. These railroads are certainly entitled to some of the credit. But in order to take care of the farmers who are tilling the soil, you must look after cheap transportation for them, if you want to protect them.

A few years ago the farmers of the great West had to burn up their corn because it did not pay to transport it, as transportation was so high. When, a long while ago, the Erie Canal was opened after much labor, matters were improved, but the facilities it now offers do not keep pace with what we need. By digging out this river and bringing your ocean vessels to the capital of your State, you will change all this, but you must also enlarge your Erie Canal to Buffalo. You make it a ship canal, and then cargoes can be placed direct on the vessels and sent right through to Liverpool. The other canals—the Champlain and the Oswego—should also be developed—so complete control of this Western commerce can be obtained. See what they are doing to the Welland Canal. They are spending vast sums of money there. They are seeking to so improve it that if we do not meet them on this question, they will divert all our commerce in that direction. The English people are trying to make that a great highway. We should look upon that with a jealous eye. Shall the Government come in and make this great enterprise a success? I don't see why other States should not come in and contribute toward it. When Congress passed a law to dredge the Mississippi, the Ohio, and the Missouri, New York willingly contributed her share into the Treasury of the nation for this purpose. A few years ago a few men succeeded in finding a way across the Rocky Mountains. To-day the entire continent is connected by railroads. What did the United States do toward the building of that first road? It gave its bonds. The money borrowed to put that great enterprise through was guaranteed by the Government, and to this the State of New York contributed its share. What did the State of New York do? It said, aye. The Government gave the road lands to encourage it, and what did the State of New York say to this? It said, aye. What has the Government done for the State of New York? It has spent a few dollars to dredge out the Hudson River. They spent some money to dredge out Hell Gate, and put a few guns into Fort Lafayette. That is all that the Government has done for New York, but New York has always come to the front in developing the great West. I think we should make this ship canal and dig out the bottom of this river. You have got to command the great commerce of the West. When De Witt Clinton established the Erie Canal what was the West? It was almost a desert, and compare it with its wonderful condition to-day. Its influence is felt everywhere, and New York receives great benefit from it.

It is not the princely merchant that turns the crank by which the great stone palaces in New York are built. It is the West that has done it through the Erie Canal, and the canal stands there to-day and it has hardly been improved. The age of electricity is coming, and progress in every direction is made, but nothing is done to improve our water ways. Enlarge the Erie Canal and connect it with New York's beautiful harbor and the inland waters of the Great Lakes, and the money spent will not be in vain. It will bene-

fit those great prairies of the West, to which is attracted the emigrants from other shores. To my mind you should also enlarge and improve the Mississippi also, so as to open commerce from there to the city of New York. We are now only in our infancy. Just think of what has been done in the past one hundred years, and by that judge what we will be in the time to come. The time will come when you will hear the trip hammer in the Rockies—when the fertile lands of the West will send direct across the waters their corn and their wheat, and bring back the merchandise of foreign shores. I do not think that Chicago could have been the great city to-day had it not been for the commercial trade of the city of New York.

I repeat, don't neglect our commerce and compel it to seek other channels through Canadian waters, and thus lose to the State of New York the trade which properly belongs to it. By opening this water way, we protect the people against high tariff and high freights. This is the least which ought to be done for the Erie Canal, which has done so much. Before its existence Buffalo and other western cities were nothing but bare prairies with their log cabins, and now civilization and progress stretch out to Washington Territory and Puget Sound, where even vessels from China touch with their cargoes that are brought from there by the railroad to New York. The time will come when all this commerce will be brought to the city of New York by this Hudson and Erie water way, if you make it a great highway. Hennepin Canal should also be made a great highway. There is no doubt but it can be done, though it may look difficult. When the Erie Canal was projected, there was great doubt expressed about it. It was treated as chimerical, and it was said it would not benefit the State; and look at the result! We have gone on with it until through these canals we have become the great Empire State of the Union.

W. H. CROMBIE.

[Mayor of Burlington, Vt.]

Mr. President and gentlemen, the subject before us has been so ably and completely presented that it seems idle on my part to discuss it further, but I want to say to you that Vermont is deeply interested, and I am sure that when the proper time comes you will have our earnest and heartiest support. The firm with which I have been connected for a number of years have been large shippers of lumber to South America and other foreign countries. Lumber for the South American market we have generally shipped in bond, by cars, from Ottawa, Canada, to Mystic Wharf, Boston, and put it immediately aboard ship at that point, paying freight thereon at the rate of 13 cents per 100 in bond, or $39 per car of 30,000 pounds. This lumber can be shipped to Albany for $25 per car of 26,000 pounds, and if the Hudson River were deepened could be put on board barks and ships in Albany and transported to South America probably for about the same rate of freight as from Boston and New York.

JOHN H. CHASE.

[Representing the Rochester Chamber of Commerce.]

Gentlemen, I intended to say a few words in the interest of commerce, but the matter has been so thoroughly gone over that all I need say is that this enterprise will have our support.

J. Y. McCLINTOCK.

[Secretary of the Rochester (N. Y.) Chamber of Commerce.]

Mr. Chairman, the Rochester Chamber of Commerce took such an interest in this matter that they have sent a delegation here. Mr. John H. Chase, the leading miller of Rochester, is a member of that delegation, as is also Mr. Brewster, the cashier of the Traders' National Bank of Rochester. The latter will now address you.

HENRY C. BREWSTER.

[Of Rochester (N. Y.) Chamber of Commerce.]

Gentlemen, at a meeting of the Rochester Chamber of Commerce a resolution was passed favoring the project of improving the Hudson River. We felt that it was of great importance to the entire State of New York and to the great West that this improvement should be made so that the harbor of New York should be extended up as far as Albany, bringing all the adjacent country 150 miles nearer to the sea. It has been said that the Hudson River belongs to the State of New York, that this is a local enterprise. We believe that the Hudson River is an arm of the sea, the same as Long Island Sound, and that it should be improved by the General Government the same as is Long Island Sound and the Mississippi River.

Rochester is the fourth city in the State of New York, and is a large manufacturing place. Our facilities for shipping by railroad are good, but we believe that the water ways should be improved.

Everyone knows that the cost of transportation by water is much less than by rail. If we could ship our goods to Albany and put it on board a steamer there bound for Europe or South America—of course there would be a great saving in carrying it down the river by small boats as is done now, which makes a great loss of time and too much expense for the canal boatmen. They could probably make twice as many trips if they could stop at Albany, and of course the Erie Canal is a very important feature in the transportation from the West. It has been suggested that the Erie Canal should be improved as well as the Hudson River. To us it seems that if the General Government will put the Hudson River in such shape that ocean steamers could come to Albany the people of New York would come forward and bring the Erie Canal up to its fullest capacity; that if the Government would deepen the Hudson River that the people of the State would be encouraged to come forward and do their share. We feel that Rochester is as much interested in this improvement as is Albany or any of the cities along the Hudson, and that if Rochester is to be benefited by it, and extend its commerce through the lakes, even as far as Duluth, not only ourselves but this whole section of country would be largely benefited.

Our secretary, Mr. McClintock, is better prepared than I am to state this matter.

J. Y. McCLINTOCK.

[Secretary of the Rochester (N. Y.) Chamber of Commerce.]

Mr. Chairman and members of the Commission, we have been instructed by by the Rochester Chamber of Commerce to appear before you on behalf of the business interests of that city in favor of the improvement of the Hudson River by the United States Government. Rochester is the fourth city in size in the State of New York. Her population has increased during the past decade from under 90,000 to over 138,000. While the census of 1880 showed returns from seven hundred and thirty-five manufacturing establishments, over two thousand distinct concerns engaged in productive industry have already been reported for the Eleventh Census. Her prosperity is on an enduring foundation and her people have confidence in her future. The apparent reasons for her success are the enterprising character of her people, a location in the center of as productive an agricultural region as there is on earth, her proximity to both the anthracite and bituminous coal beds, the cheap water-power supplied by the Genesee River, an extremely healthy and bracing climate, and her unsurpassed transportation facilities. Rochester's importance began with the opening of the Erie Canal, and has increased with every enlargement of that canal and with the building of every railroad near her. Her freight business is of enormous volume. It crowds and overtops continually the extensive facilities afforded by the railroads. It is said that what she gives to the New York Central and Hudson River Railroad is more than one-quarter of the whole local freight business of that system. Our manufactures are so diversified that we do business with all of the country and all parts of the world.

The deepening of the Hudson River so that ocean steamships and large vessels can come to Albany would mean placing Rochester 150 miles nearer to the Atlantic Ocean. Steamers would start from Albany not only for European ports and for the Atlantic ports of the United States both North and South, but for South America as well. We are greatly interested in the expansion of the

trade with South America. Our manufacturers are already carefully studying the field. In a list of articles taken to Brazil by the Brazil Steamship Company are named one hundred and fifty-nine which are produced in Rochester or its immediate vicinity. We want their nitrates, tropical woods, hides, fruits, etc., delivered as near as possible to us before breaking bulk. We want the phosphates, cotton, and fruits of the Southern States at the lowest cost.

Rochester is at the foot of the hill from the great bituminous coal fields, with a short haul, and will load millions of tons in the future for distribution from Albany to all the Atlantic ports.

The purest and probably the most cheaply mined deposits of salt in the world are only 40 miles south of us, and that wonderful product of the earth, which is to be used in the future in untold quantities, not only in almost all industries, and in the manufacture of many chemicals in common use, but in the production of cold storage in all warm countries in place of ice, will be distributed from Albany by the million tons. The age of aluminum is opening up, and western New York is destined to be the seat of its production. With the unlimited cheap water-power to be made available both at Niagara Falls and Rochester, combined with cheap coal and salt, no other district can compete with it. The only thing necessary to bring will be the aluminum ores, which will come in vast quantities from Greenland and other places on the ocean, through the Hudson River; clays of different quality will be used in increasing quantity and will come, as they now do, by the Hudson, but at less cost.

I may say right here that Rochester forty years ago had the largest flour industry in the world. To-day we make fully 5,000 barrels of flour a day. We stand third on the list now—Minneapolis first, St. Louis second, and then Rochester. There are eighteen mills in successful operation, and every one of them has been enlarged in the past two years.

Water transportation has still a great advantage over the railroad. While the cost of hauling freight upon the rail has been greatly reduced, yet the cost by water has been correspondingly lowered. While the railroad has accomplished it by increasing the weight of train and so decreased the cost of labor, on the water it has been reached by enlarging the ship, increasing the depth and lengthening the locks, and the actual cost by the canal is still less than one-half of that by rail, and by ships for less still.

We have dwelt upon the advantages to accrue to us locally, but they are also to all of the great West. The cost of transportation upon its products will be reduced by deepening the Hudson so that the ocean voyage for freight begins at Albany. The portion of the voyage of every canal boat from Albany to New York is the expensive portion. In the case of mule power they are doing worse than nothing from the time of leaving Albany until the return, because they are eating their heads off, and besides there is the loss of productive time, both as to capital invested and the pay of a useless crew. In the case of the steam canal boats it is fully as bad. They are constructed to work to the best advantage in the canal at very low speed, and when on the river they can not be run at a rate of speed great enough to be economical.

We desire to see the great stream of commerce continue to flow through this Empire State, because while it is of benefit to others it is of great benefit to us. We look forward to a further enlargement of the canal and a great increase of its business, and as a leading community of the State we expect to willingly bear our full portion of the cost of it to the State.

While we say, far distant be the day when the Erie Canal shall be given over to the control of the General Government, we urge the United States Government to make an improvement worthy of this noble river and the vast interests dependent upon it. We ask it on the grounds of justice, equity, and sound public policy, and say that if this is done it will make it easy for us of this State, when the proper time comes, to make that enlargement of the canal which will be of the grandest benefit to the largest portion of the nation. The effect of the improvement asked for will not be to create a rival to New York, but will, in effect, extend New York's magnificent harbor to Albany.

F. F. WHEELER.

[Secretary of the Albany (N. Y.) Chamber of Commerce.]

The Business Men's Association of Syracuse appointed a delegation of three, of which Senator Francis Hendricks is chairman. I do not think Mr. Hendricks has come in. Mr. Howard G. White, of the assembly, is also a member, but he does not appear to be here. The other delegate, Mr. John Lighton, is present.

JOHN LIGHTON.

[Of the Syracuse (N. Y.) Business Men's Association.]

Gentlemen, I will simply say that we are here to swell the crowd. We have always contributed our share in the improvements, especially with regard to the canal. We have the honor of having made the first lengthened lock on the Erie Canal in the State, and we want to shorten it and make it of the height of the canal at Troy. By deepening the Hudson River you will shorten our distance to New York 150 miles. At present we do not consider that we are at our journey's end until we reach the city of New York, and, as I understand it, the reason that we have to go to New York is that the channel is so narrow and there is so much less water at Troy and Albany that it is cheaper for them to go through than to reship their grain, whereas if they could deepen the basin at Troy and Albany they could reship their grain at a reasonable rate and thereby save 150 miles.

We all hope that you will join us in getting the United States to improve this channel. I think it can be done with a very little money. We are trying now to lengthen all the locks, and by doing so, you double the capacity of the canal. At present only a limited number of boats can get into the lock, it being so narrow, and the result is that many have to wait, causing delay and expense. I have always been in favor of the canals, and have done all I could for them, and have given the subject much attention. I have been called a "canal crank." I asked for $30,000, for the purpose of lengthening the canal locks at our place and got it, and the result was that we doubled our capacity.

We earnestly desire the improvement of the Hudson River from Troy down, thereby shortening the distance to the canal 150 miles, and by the time you have the river cleaned out, that we may have all our locks lengthened, so we could have 8 feet of water there. There are some levels there that will carry 8 feet of water now, providing the sediment was cleaned out to the original depth.

I will only say in conclusion to you, gentlemen, give us a helping hand and push this thing along, and we will all work together to accomplish this great improvement.

Mr. WHEELER. Mr. Chairman, I have a series of letters and resolutions sent to us from commercial bodies of the West—from Detroit, Cleveland, Chicago, Burlington, Iowa, Mankato, and many other western places. What is your desire in relation to them?

Col. GILLESPIE. They will be noted as having been received by the Board to be considered in connection with the subject that has been under discussion to-day.

Mr. WHEELER. I think, Mr. Chairman, that concludes, with one exception, all the speakers who have notified me of their desire to address your Commission. I am aware that there were several other delegations that were expected here. If there are any others present who desire to be heard, now is the opportunity. (After a pause.) There seem to be no others, Mr. Chairman. Hon. D. Cady Herrick, of this city, has been requested to make the closing argument.

D. CADY HERRICK.

[Of the Albany Chamber of Commerce.]

Gentlemen of the Commission, I was assigned to make the last address to you upon the assumption, I believe, that all the other speakers that were to be here would consume all the time, or at least that, if they did not consume all the time, they would leave no ground for me to cover, and that, therefore, my remarks would be brief and well calculated to disperse any audience that might assemble.

I do not know exactly what the province of this commission is, and just what subject will enter into your report or what special matters you will take into consideration in making your report to Congress as to what should be done here. But if, when this question was first broached to you, you apprehended that it was nothing but a local matter, it seems to me that, judging from the audience that you have seen gathered here before you to-day, not only from this State, but from other States who have signified their approval of the contemplated project, you must have been satisfied that this was much more than a mere local matter in the interest of Troy and Albany.

I will say in addition, and in furtherance of that idea, that the Legislature of the State of New York in both its branches has to-day unanimously passed a res-

calling upon its representatives in the Senate and House of Representa
Congress to use their votes and influence to carry the object we are seek-
successful issue.
were this a mere local matter, it seems to me that there is enough in it
ess itself to your favorable consideration, and induce you to make at least
ression upon the Federal Government.
attention has been called to the very large population which centers
the head of navigation upon the Hudson River. Albany and Troy are but
There is a large and steadily growing population, and it bids fair in the
distant future, to be the center of perhaps the largest population of any
of the State excepting that around New York Harbor. That is something
should be taken into consideration in determining as to whether the chan-
he Hudson River should be deepened and broadened some twenty miles
reaches the dam above Troy, even if it should go no further.
broader ground of larger interests which are involved, are the upper
of the Hudson River. It has been well and properly illustrated here that
eat problem of to-day is cheap transportation, and it requires no argu-
because those who have given special consideration to the subject are
that water transportation is the cheapest transportation discovered up to
me, and the problem is how that transportation shall be made still
r.
attention has also been called to what this particular channel means;
means not only an outlet for the State of New York, but an outlet to the
for the West and Northwest, and I can only recapitulate and sum up, if
ase, those things which have already been presented to you.
are doubtless familiar with the fact that the trend of commerce tends to-
he Great Lakes instead of being toward the South to the Gulf, and doubt-
will tend more and more in the same direction as the years roll by.
I think there are few of us who really appreciated the commerce of the
Lakes until we heard the statement of the gentleman from Duluth, and
at commerce, great as it now is, has scarcely gone beyond its infancy.
we consider what it will be in the next few years, it then becomes a ques-
ether we shall hold that commerce, or whether it shall proceed through
minion of Canada, and that seems to be one of the great problems pre-
to our people, whether we should control that commerce ourselves, or
t to drift into foreign domination.
attention has been called to the fact that the colonies of Great Britain
een spending enormous sums of money for the purpose of securing ocean
tion, for the purpose of securing a route from the Great Lakes in order
u can move from Duluth, or from the Lake of the Woods, if you please,
ean-going vessels clear through, and from thence across to Europe. While
e expending these vast sums for maintaining deep navigation for only a
listance, we have been lying supine and idle. Not only has New York not
hat which she ought to do, but the Federal Government has been absolutely
nothing. While it has spent thousands of dollars, and spent it well, it has
other directions where only small sections of the country are benefited,
this great water way, which has done so much to build up the West and
eat Northwest, which the State of New York has practically maintained
and alone, has been neglected. The sum which has been spent by this
l Government on this water way is not as much as the city of Montreal alone
pended to assist in extending its water way.
, it seems to me that this cheap water transportation is something to be
into consideration by you; whether the Hudson River is a factor in that
n; whether we can gain cheaper transportation by broadening and deep-
the Hudson River to its head; whether we can not have the distance from
an lessened by 150 miles; that cheapens transportation, and this cheapen-
the problem of transportation. A difference of a few cents determines
er the grain of the Northwest is to come through our territory or is to be
orted to Europe through foreign channels. It seems to me that the bringing
n steamers to Albany and Troy, and possibly sometime in the near future
ling the route through to the Great Lakes, will do more to solve the prob-
cheap transportation, and increase the wealth of the West and Northwest
nything else that can be done.
, gentlemen, I understand that the hours which you were to give to this
sion have nearly closed. The subject has been fully presented to you in all
ases.
re was one thought which my friend from Troy, Mr. McArthur, presented

which occurs to me. If I am prevented from doing or saying much, it perhaps may be ascribed to physical disabilities, yet there are one or two things which, in connection with his remarks, may be rationally discussed. They are whether the deepening of the Hudson River is not and should not be a part of the military system of the country, not only for defensive purposes, but for purposes of attack, if we are driven to it, because, if we thoroughly understand the situation, the towns along the Great Lakes are practically at the mercy of a foreign power. They have the means of placing armored vessels there almost at once, and we not only have not the means to repel them, but are prohibited from keeping armored vessels in that locality to protect ourselves, to repel attack, and to make attack.

These matters, it seems to me, can properly be taken into consideration in making a favorable report to the Government to come to our assistance.

We say that whether the Federal Government determines or whether you determine that it is wise to take into consideration the project of a ship canal or not, the time will surely come when the Federal Government has done for us that which it has done for similar tributaries in other States, the imperial State of New York will take care of its own canal sooner than have the commerce of this country driven away to other and foreign ports.

The following is a list of the letters and resolutions presented at the meeting by Mr. F. F. Wheeler, secretary of the Albany Chamber of Commerce:*

1. Resolution adopted by "Friends of the State's Beneficent Canal System" at New York, December 11, 1890, urging legislation to improve the State canals.
2. Letter from W. B. Mather, secretary Chicago Corn Exchange (of December 16, 1890), stating his belief that the improvement would benefit the Western country.
3. Letter of December 16, 1890, from C. D. Holmes, secretary of the Fargo (N. Dak.) Board of Trade, wishing success to the project.
4. Letter of December 19, 1890, from C. C. Sturtevant, secretary Minneapolis Chamber of Commerce, saying that they will give hearty support and coöperation to the project, if it will have the effect of cheapening transportation from the Northwest to the seaboard.
5. Letter of December 22, 1890, from Charles A. Chapman, secretary Mankato (Minn.) Board of Trade, sympathizing with the movement to improve the internal navigation of the country.
6. Letter of December 23, 1890, from H. T. Denison, secretary Davenport (Iowa) Business Men's Association, accompanied by resolutions adopted by that body indorsing the project.
7. Resolutions of Detroit (Mich.) Board of Trade, favoring the deepening of Hudson River so as to admit the passage of ocean craft of 3,000 tons burden as far as Troy, N. Y.
8. Letter of December 27, 1890, from A. J. Begges, secretary Cleveland (Ohio) Board of Trade, favoring the project.
9. Letter of December 29, 1890, from P. M. Crapo, president of the Burlington (Iowa) Board of Trade, strongly in favor of the proposed improvement.
10. Letter of January 2, 1891, from D. R. Noyes, president St. Paul Chamber of Commerce, approving the movement.
11. Letter of January 2, 1891, from the secretary of the Chicago Board of Trade, stating that its board of directors, by vote, approve the project to deepen the Hudson River from Coxsackie to Troy.
12. Letter of January 2, 1891, from Mayor Grant, of New York City, approving this and other undertakings to improve the commerce of New York.
13. Letter of January 3, 1891, from Edward Mitchell, mayor of Oswego, N. Y.
14. Letter of January 5, 1891, from E. B. Judson, president of First National Bank, Syracuse, N. Y., expressing great interest in the work.
15. Letter of January 5, 1891, from Henry H. Truman, of Orange, N. J., expressing approval of the project.
16. Letter of January 5, 1891, from George W. Gardner, mayor of Cleveland, Ohio, favoring coöperation of the United States Government in the work.
17. Letter of January 5, 1891, from the Cleveland Vessel Owners' Association, recognizing the importance of deepening the Hudson River, and the great service to the Northwest of the canal and river system of New York State.

*See Appendix 5.

APPENDIX 3.

RECORD OF A PUBLIC MEETING HELD IN THE ARMY BUILDING, NEW YORK CITY, MAY 15, 1891, AND CALLED BY THE BOARD OF OFFICERS OF THE CORPS OF ENGINEERS, CONSISTING OF LIEUTENANT-COLONEL G. L. GILLESPIE, MAJOR AMOS STICKNEY, AND MAJOR CHARLES W. RAYMOND, CONSTITUTED BY PARAGRAPH 1, SPECIAL ORDERS NO. 66, HEADQUARTERS, CORPS OF ENGINEERS, SEPTEMBER 30, 1890, TO CONSIDER AND REPORT UPON THE OBSTRUCTIONS TO NAVIGATION IN THE HUDSON RIVER, UNDER THE PROVISIONS OF SECTION 17 OF THE RIVER AND HARBOR ACT OF SEPTEMBER 19, 1890.

NEW YORK, *May 15, 1891.*

The meeting was called to order at 11 a. m.

All the members of the Board were present. Among those in attendance, the following participated in the discussion: Messrs. Edward Hincken and A. Foster Higgins, of New York City; Hon. Martin I. Townsend and Mr. E. F. Murray, of Troy, N. Y.; Mr. Fred. F. Wheeler, of Albany, N. Y.; Mayor W. H. Crombie, of Burlington, Vt.; Mr. John F. Lape, Greenbush, N. Y., and Col. Herman, of Schenectady, N. Y.

Col. Gillespie opened the proceedings with the following remarks:

The meeting here to-day may be regarded, I think, as an adjourned meeting of the hearing in Albany on the 6th of January last. The original meeting was held in Albany for the reason that the Board was informed that the item contained in the river and harbor act referring to the deepening of the Hudson River originated with the member of Congress from that district, and therefore the Board went to Albany for the purpose of conferring with those persons who presumably originated the item.

At that meeting the Board was a little disappointed not to find representatives of the commercial bodies of the city of New York present, and it was deemed best, in order to reach these bodies, that a meeting should be held here.

The point to be determined is the expediency of deepening the Hudson River so as to furnish a navigable depth of 20 feet from the city of New York to Albany or Troy, and we desire that anyone here—whether he resides in New York, Albany, or elsewhere—who has any information bearing upon the subject, will present it to the Board at this meeting, as this will be the final hearing.

I have a communication from the Maritime Association of the port of New York, which reads as follows:

NEW YORK, *May 8, 1891.*

DEAR SIR: I have the honor to acknowledge the receipt of your communication of the 5th instant, regarding the proposition to provide safe navigation for ocean-going vessels from the sea to Albany.

I beg to say in response, that, in view of the importance of the subject to the commerce of the United States and of this port, I have referred it to a special committee representing various interests involved.

After careful consideration of their report by our board of directors, I will take pleasure in communicating to you their views thereon. Meanwhile I remain,

Very respectfully, your obedient servant,

RICHD. GURNEY, *President.*

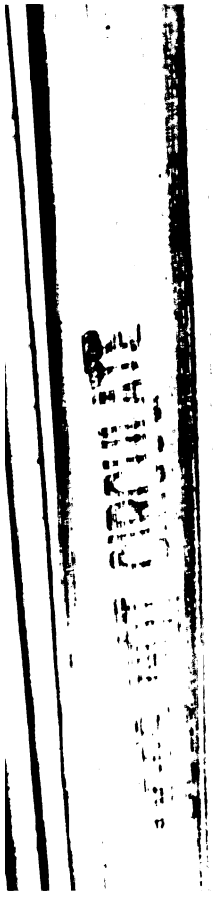
Col. G. L. GILLESPIE, U. S. A.

I have also a communication from the Tugboat Owners' Association of Albany, as follows:

ALBANY, N. Y., *May 12, 1891.*

DEAR SIR: "The Tugboat Owners' Association of Albany and Troy" desire to express their earnest approval of the effort which is being made to deepen the channel of the Hudson River so as to admit of the passage of heavy-draft vessels to Albany.

The consummation of the scheme would be far reaching in its effects upon the commerce of our country and would most assuredly be a material benefit. We can not deny the fact that our interest in the proposed improvement of the Hudson's channel is largely inspired by selfish motives, since it is apparent that the carrying out of the project must have a helpful influence upon all enterprises conducted on the Hudson and its connected water ways and railroad lines; yet beyond that it is evident to all who are not interested in the matter by reason of personal benefit expected, and who view the project unbiasedly and unselfishly, that the deepening of the Hudson as contemplated will be a grand achievement



Lieut. Col. G. L. GILLESPIE,
Army Building, New York City.

I wish to say, in addition, that a proper notification has been given to
York Central, the Delaware and Lackawanna, and the Erie Railroad Co
but that I have heard nothing from them.

Mr. Edward Hincken, a member of the board of commissioners of pil
York City, who was the first speaker, commenced his remarks with the
that the Hudson River at Albany is closed to navigation for six mont
year, and declared that the proposed improvement appeared to be entir
interests of the western country, which, according to a comparison of
transportation of produce from Chicago to Liverpool, had nothing to co
against present facilities. He produced a list of vessels drawing 20 feet
which, not being complete, he said he would furnish the Board when
mation was received. (Exhibit A.) He further stated that by loadin
York vessels would not have to put in ballast, which would be require
up the river to take on cargo. He concluded his remarks by stating
Hudson River is closed for six months in the year, on an average; th
not a boat up there yet at this date; and that on the 15th of Noven
stopped.

Mr. Edward F. Murray, of Troy, engaged in transportation busin
Hudson River, stated that never, in his thirty years' experience on th
had he known the river to be closed for six months in the year, and t
never been closed more than four months.

Mr. HINCKEN. I have a document to prove my statement.

Hon. MARTIN I. TOWNSEND, of Troy. I have lived in that vicinity
my life, and know that nothing of the kind has occurred in fifty-ei
There is another thing. The gentleman says that they have not got
there yet. The navigation has been going on for the past four weeks

Mr. HINCKEN. The canal is not open.

Mr. TOWNSEND. But traffic is handled there by the railways.

Col. GILLESPIE. Is there a representative present from the Produce
a representative from the Maritime Exchange; a representative from
of Trade, from any of the railroads, or from the Chamber of Commer

Mr. A. F. Higgins said that, being called upon on short notice to re
New York Chamber of Commerce, he had not had sufficient time to p
tistics to accompany the remarks he should make, but he considere
main question is whether the proposed work has for its object the im
of the commerce of the Union. While there is no disposition on the
New York Chamber of Commerce to try to limit the operations of th
of the world for the benefit of New York City alone, the propositic

ement is declared to be for the purpose of controlling the traffic, which, ated, is not now sufficiently accommodated, and coming in competition ne railroads. Now, which of the interests is the greater is the point to be d. He further expressed the conviction that the traffic is not in the condi- ated, but that the port of New York is quite capable of furnishing facili- fast as the growth of the commerce requires.

Raymond here inquired if Mr. Higgins could inform him—regarding an made some twenty-five years ago to utilize the deep water of the Hudson as it goes up now, and an attempt made to establish a harbor and induce s to come up there and handle cargoes, which attempt failed entirely and andoned—where such a port was located.

Higgins stated that he could not tell.

. RAYMOND. I think it was at Athens. What is the head of deep-water ation now?

HIGGINS. Newburg is a port for steam vessels, but I think it handles y local traffic.

. RAYMOND. This proposition seems to be to transfer the head of deep- navigation from Athens to Albany, and I want to find out what would be fect upon commerce, and whether, if we had communication by water at y, it would be more favorably situated than at Athens, from which point is a railroad up to Albany.

HIGGINS. I think, so far as the effect is concerned, there would be an in- d traffic at Albany.

. RAYMOND. In these vessels that carry grain and lumber through the ?

HIGGINS. All the western traffic—lake traffic.

. RAYMOND. And this traffic would be handled at Albany by tramp steam- incipally?

. HIGGINS. Very largely.

. RAYMOND. What is the draft of these vessels as a general thing?

HIGGINS. They average about 20 feet. It would take a little more depth that.

. RAYMOND. We realize that to have a channel to accommodate vessels feet there must be a depth of 22 feet or more. I wanted to find out how of the carrying trade would be affected.

. HIGGINS. There is no trouble in getting a vessel of that draft which will a very large tonnage. Whatever depth should be established, vessels l be constructed to correspond with it in draft very rapidly, if found ex- nt.

. RAYMOND. I had an idea that the tendency at the present time was to ase the draft, especially of those vessels that carry grain, lumber, and so on.

. HIGGINS. I think the most profitable vessels are those that carry about tons. There is no particular necessity for vessels of 5,000 or 6,000 tons.

. RAYMOND. Are you familiar with the statistics of tonnage down the ?

. HIGGINS. No; I can not say that I am. They can be readily obtained h, I think.

. RAYMOND. Do you think that if we had deep-water navigation, the ial which is now brought from the West and Northwest by railway would handled at Albany, or brought down on the cars?

. HIGGINS. There would only be one handling, and that at Albany.

. RAYMOND. Suppose a train of cars is loaded at Chicago, and arrives at y. Would it not cost more to bring that here on cars?

. HIGGINS. That would be a question of cost per ton per mile.

. RAYMOND. Would not the cost from Albany to New York—about 150 —be somewhat less by water than by rail?

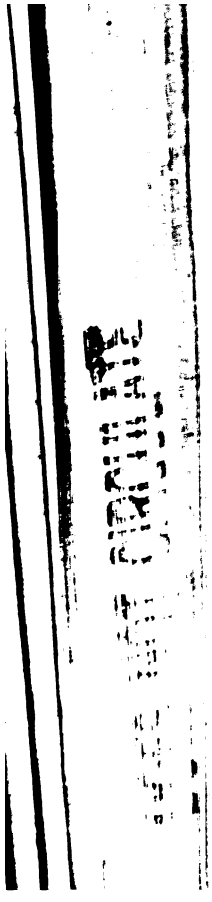
. HIGGINS. It probably would. On 150 miles there are a great many ex- s, in different ways. Steamers going up there would have to take pilots, for ice. So you can hardly tell what the difference would be.

. RAYMOND. Would not the steamers go up the Hudson with their cargoes istribute them from there?

HIGGINS. They would come from Liverpool, London, or Havre, straight r port in the United States where there is sufficient channel.

. Gillespie then inquired if there were any other commercial representa- from New York present who wished to make any remarks, to which no re- e was made.

Townsend stated that he would like to hear from Mr. Murray.



at New York City. That shows that something can be saved, even if it is q
cost of one handling. So far as local interests are concerned, the people
section would be very glad to have foreign vessels load at Troy.

Col. GILLESPIE. If the channel in the river were widened and deepe
20 feet, would you use a larger class of vessels?

Mr. MURRAY. We would have to.

Col. GILLESPIE. Would it be advantageous to you?

Mr. MURRAY. It would be advantageous to the business of the country
in favor of the improvement because I am satisfied, from my experienc
business, that it would be of increased advantage to shippers.

Maj. RAYMOND. Why do you not just take your boats down to the
deep-water navigation?

Mr. MURRAY. If we only come down to Hudson or Athens, there is
ness to go back. If they had business there to take back to Troy it wou
right. It is more profitable to come all the way to New York, where we
a return cargo.

In answer to further questions Mr. Murray stated that, in his opini
manufacturing interests would be established if the river were deepen
rates for freight would probably be reduced 50 per cent or more;
locks on the canal are being enlarged, and, should the river be deepe
State would see the necessity of enlarging the canal so that the busine
West could go through in bulk—maybe right through from Liverpool.
to do this, they propose to get 20 feet of water through the canal.

A representative from the Business Men's Association of Albany st
his organization was not represented at the hearing at Albany, but he
say that it concurred in the views expressed by Mr. Murray.

Hon. MARTIN I. TOWNSEND spoke as follows:

I desire to say a few words, in addition to what I said before, in regi
fact that business is not done at the head of deep-water navigation.

In order that there shall be a business done at any point, three or
ments should be considered. It is necessary that there not only be de
but there must be somebody there to transact the business, and some
to bring the business overland to the place where the deep water is.

Now, the business of the great West is brought to the locality repre
Albany and Troy—some say Albany and others Troy, according to t
tion, but we are practically one people. We are 6 miles apart, but p
our interests are one. The mode of life in one place is precisely wh
the other. There are large manufacturing interests in both places. It
munity of about 250,000 people, a large portion of whom are engaged in
portation business; and most of those not engaged in the business of tr
tion are occupied in a much more important business, that of getting s

l the city of New York asks a great deal. New York is having a back
ge wrought for her at the expense of the Government—a little back passage
osts a great deal of money. But we are not hostile to New York. We will
ibly assist her.
ant to say another thing, but I say it to the gentleman who spoke so intel-
tly, though he spoke with a little New York bias. I want to call his atten-
to what this work up the river has done for New York. At the beginning
e century this city stood behind Philadelphia as a port of commerce and as
ter of population, and what was it but the wisdom of one man that went
ing up the State from the Hudson River to Lake Erie that made New York
; it is? This mart of commerce would be unimportant to-day but for the
om of DeWitt Clinton and the building of the Erie Canal, which built up its
nerce and was the means of putting New York at the head of any port on
continent. And what has done New York so much good in past times can
urt it now. We, up in the central part of this State, have always been proud
ew York.
has been my fortune to be connected with politics. I used to be a Democrat,
in modern times a Republican. I have always been afraid that New York
d work against this thing, but there is a great enlightened body in New
that, I think, will be with us. At any rate, he that is not against us is for
I think the gentleman is practically for us.
elieve that the State of New York, after I am lying in my grave, is going to
truct a canal from New York to Lake Erie that will be out of cannon shot
reat Britain. We are not going to be run over by the only nation able to
with us. John Bull has got ship canals that carry the commerce of Canada
ugh all his possessions, and he can run a fleet at any time right on the lakes.
can not do it, but the time is coming when we shall do it. I do not know
that I will hear the sound of the work from my grave. Now is the time
we ought to fit our river for the coming canal. That is what we are look-
o as well as our present business interests. Just think of the pressure that
ing exerted at Washington by the Northwestern States and by our own
. Our river and harbor bills are the most beneficent appropriations that
nade by the General Government. There is a great hue and cry about them.
have to get so many accommodated that not one-fifth of the members of
House of Representatives are left out. And as soon as the bill is passed it is
unced. Still, I say that the appropriations for rivers and harbors are the
beneficent appropriations made by the General Government. We are now
ple numbering 64,000,000, and in twenty years we shall be at a hundred mil-
, and can we not improve a little space in the Hudson River when the Missis-
, which, although carrying an immense amount of water, does not do anything
the business done upon the Hudson, is so well provided for?
is measure is bound to come. It may not be in the next Congress, it may
e in the next but one, but it is one of the things that will knock at the doors
ngress until it is accomplished.
hatever has been done to the State of New York to improve the facilities of
nerce so as to bring the products of the great West here instead of their go-
o Philadelphia and Baltimore, has been done by the State. I do not know
hat the State will construct this canal, but it ought to be done by the Gen-
Government. At present we simply ask that the river be enlarged so as to
nmodate the business of the West, and the business of the North, and the
ess from Canada, and the business from India that comes over the great
that enter into this region of 250,000 people, so that freight can be placed
the large vessels there to go outside of Sandy Hook, or come to us from any
of our immense country, or from the outside world.
. Higgins, speaking in regard to the appropriations made for the Mississippi
r, said they were principally for the purpose of protecting life and property
its banks, and that therefore we have a right to make those appropriations.
e case of the Hudson River, the whole question is one of the merits or de-
ts of the project. If found on investigation to be for the interests of the
le, the city of New York would welcome the improvement. But as far as
Chamber of Commerce was concerned, it was believed that the resources of the
try are now exhausted because of the number of projects on foot to draw from
er money, which is her life-blood, and the financial condition of the Treas-
s threatened by the numberless drafts that have been made for similar pur-
. This project should stand upon its own merits. It is not a question of
her it will benefit Albany or Troy, or any other place on the river. It is a
tion of whether it will benefit the commerce of the whole country. The
r ways are no longer the great necessity they were in former times, now that

the railroads have lined their banks, and low rates of transportation have been effected.

Mr. Townsend, replying to the allegation that the country is exhausted by river and harbor appropriations, said that when he entered Congress, in the fall of 1875, the Government indebtedness was a little over $2,100,000,000, and that since that time the Government has brought that debt down to a little over $700,000,000, a reduction of over $1,400,000,000, besides paying the annual interest—that is the "exhaustion of the country."

Mr. Fred. F. Wheeler, secretary of the Albany Chamber of Commerce, stated that he wished to emphasize one point that had already been referred to, which was that the fact that New York State is the Empire State and New York City the Empire City is more largely attributed to the Erie Canal than to any other cause, and New York would probably lose nothing by the proposed improvement. We must not forget that the Government has not only expended an immense amount of money for the Mississippi River, but the Government does not confine itself in its appropriations for that river to measures for the protection of life and property. The Government has been making appropriations for the port of Galveston for the very purpose asked for here, that of assisting in lessening the cost of transportation. This is not a question of whether we shall protect the interests of the railroads or protect the shipping, but of protecting the interests of the greatest number of our citizens. The farmers are compelled to sell their produce at a price shipped to Liverpool, the market of the world. The price delivered at Liverpool is the amount they receive. Now, it follows that if the cost of transportation is reduced they will reap the benefit. It is an axiom also that the larger the draft of vessels the less the cost of transportation. This increase of depth in the channel will result in lessening very materially the cost of transportation of these products.

The object of this improvement is not necessarily the promotion of the business interests of the city of Albany. Canada has expended millions in the improvement of her canals, and is trying at several points to divert the transportation of Western products in her direction, and if we content ourselves with present business and present facilities we shall certainly be left behind. We must meet their efforts by just such practices. In addition, he did not think that the question before the Board was one of appropriations. Congress has asked, "Is this improvement a wise one?" It is very important that we should find out whether the proposed improvement will enable our Western producers to ship their goods through our ports at lower rates. Albany and Troy will coöperate with New York in maintaining the commerce that comes to our ports from all the markets of the world, which commerce will deteriorate if we content ourselves with present facilities. The cost of the proposed work has been stated anywhere from ten to forty million dollars, but that is a matter upon which the Board is much more competent to express an opinion than others. The distance to be covered is not great, being only about 20 miles, and in many places the depth is now 18 or 20 feet, and in those places the cost would not be much. He regretted that the gentleman from the Chamber of Commerce of New York had not had time to investigate the matter more thoroughly. The benefits might not, in the gentleman's opinion, justify the enormous expense, but it is believed by those who have given the subject more thorough investigation that the work is directly in line with the internal-improvement policy of the Government.

Mayor W. H. Crombie, of Burlington, Vt., said that he had been for many years connected with the wholesale lumber trade, and it was his opinion that, were the Hudson improved as proposed, a large amount of lumber that is now exported from Boston to South America would be shipped from Albany or Troy. The lumber at the present time is shipped in bond from Ottawa to Boston and New York. The cost from Ottawa to Albany or Troy is $25 per car, and to Boston $39 per car, so if the Hudson is deepened as proposed the cost will be much reduced.

Mr. JOHN F. LAPE, of Greenbush, N. Y., read the following, which he said he had prepared for the consideration of the board:

Gentlemen, the project to deepen the Hudson River provides for a ship channel of uniform depth and width from Coxsackie to Albany and Troy, so that ocean-going vessels of 3,000 tons capacity can reach Troy and the dock of the Watervliet gun foundry at West Troy.

Throughout the world of commerce we find a cry has been raised for the improvement of rivers and water ways. In Europe gigantic works are now in progress. France will expend $175,800,000 for harbors and canals, a sum larger than all that has been expended for rivers and harbors by the United States

ıce its organization as a government. Even the Russians have been at work nverting St. Petersburg into a seaport by digging a canal 20 miles in length. anchester, England, is about 40 miles from Liverpool, with six lines of railway nnecting the two cities, yet a ship canal will soon connect the two cities which ll require the removal of 47,000,000 cubic yards of earth, at an estimated cost $40,000,000. The Germans are having surveys made for a ship canal across untry to the Oder River and thence to the Baltic Sea.

The Nicaragua Canal will unite the Atlantic and Pacific and soon become the orld's great highway.

Water ways furnish means for the transportation of heavy and bulky merandise, such as coal, iron ore, scrap and pig iron, stone, and timber, which ten will not pay the cost of transportation by rail.

With railways penetrating every section of our fertile country, the Great akes of the West, and inland water ways, our home commerce has grown to ıormous proportions, but is as nothing compared with what the next score of ars will show. From Henry V. Poor's Railway Manual we learn that in 89 the railroads of the United States carried 619,137,237 tons of freight. Deıcting from this amount 25 per cent for duplication, there is left a net tonnage 468,352,928 tons, with an average value of $30 per ton, making a grand total $14,050,587,840.

A newspaper published at Duluth gives some figures of the tremendous comerce of the Western lakes, and refers to the St. Mary Canal as follows: "Dur-8 days of navigation in 1890 there passed the canal 9,041,213 net tons of freight, alued at $102,215,000 at an average ton value of $11.31. In 1881, when the Gen-al Government assumed control of the canal, the value of the freight passed as $28,965,000, at an average tonnage value of $18.50."

From late statistics, 1889, it is shown that wheat was carried on the lakes for mill per ton per mile, while the average rail freight charged per ton per ile in 1889 was 5 mills. The commerce of the Hudson River from the State dam Troy to New York City is not far from 18,500,000 tons per annum, and of the eat Mississippi, "The Father of Waters," about 7,500,000 tons. By an act of ıe Forty-sixth Congress President Hayes was given power and authorized to eate a commission to improve that majestic river, and up to the present time out $13,000,000 have been expended for dredging, building dikes and levees ong the river, and the lowest estimate of the amount necessary to complete ıe work is $20,000,000.

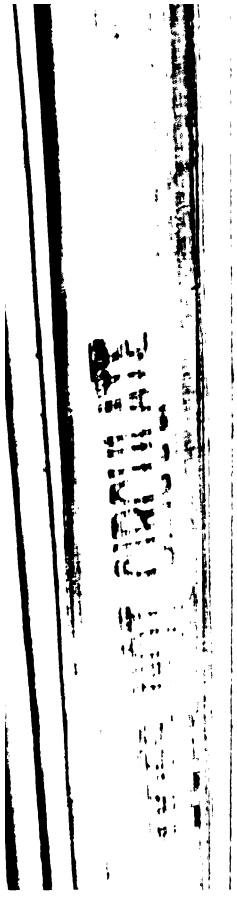
The General Government and State of New York have expended something er $2,780,000 on the Hudson River, while the State of New York alone has exnded over $135,000,000 for construction, maintenance, and operation of the free rie and other canals throughout the State. The present average tonnage of ıe canals is 5,106,401 tons per annum, valued at $150,000,000.

The commerce of the Western country and the great inland lakes has already ached such immense proportions that numerous trunk lines and water ways to ıe seaboard have become rivals for the export trade. The distance from Buffalo New York City via the Erie Canal and Hudson River is 502 miles. From ort Colborne, Lake Erie, to Montreal, via the Welland Canal and St. Lawrence stem, is 365¼ miles, and from Buffalo to West Troy, via the Erie Canal, 346 iles, or 19¼ miles shorter than the Canadian route. To make Montreal a seaort the St. Lawrence River was dredged through Lake St. Peter from 10½ to feet, and the total amount expended was about $5,000,000. The city of Montal is busy expending $4,000,000 on its docks and wharves, and is determined to ecome one of the leading commercial cities on this continent.

Henry K. Wicksteed, an engineer of the Province of Ontario, has a plan for ıe enlargement of the canals of Canada so as to provide a water way for oceanoing steamships from Montreal to Lakes Superior and Michigan. In a letter a newspaper explaining his plan he says: "Ocean steamships moving at the ate of 10 miles per hour can carry and make money at one-twentieth of a cent a little more per ton. Hence, it is a foregone conclusion that could we take ı ocean steamer to Chicago, Milwaukee, Duluth, and Port Arthur they would arry nine-tenths of the grain trade."

The cost of improving the Canadian canals would be $70,000,000, one-third ore than the estimate for the Nicaragua Canal. Our Canadian neighbors ıould be commended for their enterprise, and they are entitled to all the Western ade they control. The development of the country surrounding the Great akes will soon need all the shipping facilities a dozen seaboard cities can furish to export the increasing European grain and provision trade.

Deepen the channel of the Upper Hudson and you bring Buffalo and the entire Western country 150 miles closer to the seaboard, save 300 miles towing, and ex-



could send their iron-clads up this river and burn up the city of New Yor
all our cities. With this improvement the war ships of the Government c
up to Troy and be fitted out with supplies and steam out to sea. We c
tell what may take place, and it is very important that this river sho
deepened. It is the natural outlet of the great West, as all its commerc
down the Erie Canal, which has had a great deal to do in making New Yo
Empire State, and on which the General Government has hardly exper
dollar. Our fathers went to work and built this canal, and what was it alo
line of the canal? A wilderness! Chicago was nothing but a village wh
canal was built, and to-day it is the greatest city in the West. It is the d
Congress, under the Constitution, to look after the commercial interests
different States. By the present combinations of the railroads millions
out of the pockets of the people. The great commerce of the Northwest
trolled by the railroads, and it is the duty of Congress to look after it.
improvement is not undertaken, freight from the West will go down th
land Canal, and vessels will come direct to Chicago, take on a cargo, and
rect to Liverpool. Looking at it from a war point of view, it is practic
day to take war vessels drawing from 10 to 15 feet of water through the W
Canal, while we have nothing to protect ourselves. When DeWitt Clint
before Congress to urge the building of the Erie Canal he was told that
a hundred years in advance of the age; so New York built the canal,
General Government had nothing to do with it. The Hudson River is t
let for the great grain business of the West, and this work ought to ha
done years ago; it will be the opening wedge for a great ship canal, and
nois deepens the Hennepin Canal, a great highway to the Mississippi.

Col. GILLESPIE. Is there any other gentleman who wishes to present hi
to the Board? The Board will be glad to receive any papers or memo
writing that any persons wish to submit at this time, and any person w
desire later on to present a report may do so in writing. There will be
ther public hearing of the Board. The examination, however, has not be
pleted as yet and will not be for some weeks. In the meanwhile we shall
to receive further information from any source to assist us in our delibe

Mr. MURRAY. We would like to ask that you report in favor of the ir
ment to Albany and up to the head of tide water at Troy.

Col. GILLESPIE. There are three projects which the Board has to c
To which do you refer?

Mr. MURRAY. We favor the 20 feet of water.

Mr. WHEELER. And also 12 feet to Troy.

Col. Gillespie then announced that he had just received another comm
tion from the Maritime Association of the port of New York, which h
read for the information of those present. The communication was as fo

material prosperity. While by such improvements some trade may be
l into unaccustomed channels, yet by stimulating sources of production
rease commercial and mercantile activity for the general good.
Hudson River is one of the great arteries of the commerce of the United
Through its connection by land and water it directly connects the chief
of the continent with the interior, bringing its products to the ocean and
ıg needed supplies. It seems obvious that for the common good such
ıication should be as unobstructed as possible.
would therefore suggest the following resolution:
lved, That the board of directors of the Maritime Association of the port
York recommend that, in conformity with the river and harbor bill en-
' Congress at its last session, the navigation of the Hudson River be im-
so as to permit the safe passage of ocean-going vessels to Albany."
oard generally discussed the matter and the foregoing resolution was
ously adopted.
s. Alfred D. Snow, Charles P. Sumner, and W. Irving Comes were des-
by the president to present these views to the U. S. Board of Engineers
ame of the association.
t:

A. C. ELLIOT, *Secretary.*

NEW YORK, *May 15, 1891.*

ndersigned committee, appointed by the Maritime Association of the port
York to present the views of the association, respectfully submit the

ALFRED D. SNOW.
CHARLES P. SUMNER.
W. IRVING COMES.

ıeeting then adjourned *sine die.*

A.

STATEMENT OF MR. EDW. HINCKEN.

Cargoes of grain by sailing vessels from New York.

Tons register.	Bushels.	Feet draft.	Tons register.	Bushels.	Feet draft.
468	29,105	17	897	49,386	20
376	23,707	17.9	897	50,300	23.3
460	27,128	17.9	987	54,296	20.6
417	25,777	18	852	50,425	23
642	36,199	18	1,012	59,871	24.3
698	40,887	19.6	846	43,000	20.6
650	37,147	18.6	941	55,122	20.6
776	45,000	20	1,061	50,003	20.6
982	50,903	20.6	1,450	86,631	23

tons register carried 931,526 bushels of wheat—55.48 bushels per ton

tons register carried 1,288,179 bushels of corn—57.50 bushels per ton

Draft of water on the following cargoes (grain).

Bushels.	Feet.	Bushels.	Feet.
54,700	21	53,183	21
45,540	20.6	51,103	20
44,593	19	54,957	21.6
68,607	23	24,031	16.6
50,686	19.6	26,907	18.9
35,199	18	60,367	21.6
24,031	16.6	39,216	18.6
60,367	21.6	46,381	20
44,362	20.9	40,000	19
42,442	18.6	77,725	23
42,100	19.6	60,563	21

ld steam tramps will carry 2,500 tons on 20 feet; the modern from 2,600

EDWD. HINCKEN.

, Col. GILLESPIE, *U. S. Engineers.*

APPENDIX 4.

COMMUNICATION FROM THE COMMITTEE ON HARBOR AND SHIPPING OF THE NEW YORK CHAMBER OF COMMERCE.

CHAMBER OF COMMERCE OF THE STATE OF NEW YORK.

GENTLEMEN: The committee on harbor and shipping of the Chamber of Commerce, having heretofore appeared before your honorable body in person, now, in accordance with your request, present to you the thoughts which have occurred to us in the consideration of the question before you. We rest with satisfaction upon the belief that before arriving at a conclusion your very able body will exhaust all available sources of information, and will only recommend the undertaking upon positive facts and results to be assured thereby.

We are of opinion that not less than 20 miles of the river must be excavated from a present average of 9 feet to a further depth of 22, and that a width of not less than 300 feet should be provided, which would show that not less than 15,000,000 cubic yards of earth and rock are to be raised and taken away, of which a large proportion must be rock and of which the quantity is unknown; that large retaining walls or banks will probably be required, and other extras always attendant on all such work. The expense in rough figures will in all probability not be less than $10,000,000 and may amount to four times those figures. It is therefore a question of undertaking this gigantic outlay which is before us and you. In weighing it we immediately arrive at a conclusion that it can not in any sense or degree be regarded as a "work of necessity."

The immense exports from New York Harbor in 1890, amounting to 6,258,222 tons, were brought here, handled, and carried away without any real or apparent obstruction or retardation, and these figures represent only the foreign exports, whilst the foreign imports alone equal this tonnage, and a vast additional tonnage arrives here coastwise and from the interior, which is also handled and distributed with equal, if not greater, facility.

We respectfully submit that the free and general statements made to your honorable board by various speakers from the interior as to the lack of facilities, want of dockage, etc., are largely imaginary. Your honorable board is certainly aware that a large, unoccupied water front still exists in the waters of the harbor, which, if any crying necessity called for, could and would soon be improved. The fact that it is not demonstrates either that the present supply fits the demand or that the charges are so low for its use as not to encourage further development.

We would suggest that figures and precise statements be required of the advocates of this project, as to where the economy and saving in handling is to be effected by changing the point of handling to Albany. We very much doubt the fact. Be that as it may, it needs no argument to sustain our conclusion that the whole project is to be deemed and considered solely as one of "expediency," and unless it can be shown to you beyond peradventure that a most positive advantage and gain to commerce is certain to flow from the improvement, we respectfully submit it should not be encouraged by your favorable report.

This committee can not look upon the proposition as in any respect changed by its being a request for the General Government to undertake it, from the light in which we should regard it were it a request for the State of New York alone to incur the expense; nor does it properly affect its consideration that it will incidentally benefit the cities of Albany and Troy, or even the State at large. The United States Government should only be asked to undertake works of national value and importance.

The first objection which occurred to us was that the part of commerce to be affected by the project is of a very limited character, and, briefly, embraces only one class of vessels, viz: the transient freight-seeking steamers, drawing 20 feet of water and less when loaded, and even of them only such a number as could avail themselves of the facility during the very brief period between harvest and the closing of the canals, and again in spring after the opening of the canals until the movement of the crops ceases. It is self-evident that the steamers of the regular lines from New York to foreign countries have nothing to gain by the change, and having facilities and contracts arranged at great cost and trouble, will certainly not abandon them for anything this project offers. We think we do not err, therefore, in saying that only the transient and freight-seeking steamers would avail themselves of the facility by any possibility.

ntire quantity of merchandise exported, there were shipped during 1890
York:

	Tons.
s	4,829,775
	1,428,447

nk it may with equal reason be assumed that no sailing vessel would
d to go to Albany to load, in preferance to the present practice. When
lered that to-day wheat is carried from Chicago to New York for 5 cents
l, it will be obvious that no saving in transportation, by discharging the
lbany, could possibly counterbalance the additional cost to a sailing
e towed to Albany, and for the additional time of demmurrage to the
l pay and maintenance of crew during the voyage up and down.

the entire tonnage brought to New York from all sources and by all
es, out of which this amount of 6,258,222 tons was taken for foreign ex-
entire tonnage derived from the canal system and brought to tide water
765, a very considerable amount whereof was distributed within the
ates and not exported. Taking that class of products which constitute
traffic of the canal, which will be the most favorable to it (viz, the
ie percentage delivered at New York by canal was 24½ per cent against
nt by rail and other routes. Applying this percentage to the total ex-
ould show a possible total of 1,548,910 tons exported as having been the
ion of the canals. We have had a careful statement prepared of the
n of exports carried by the regular lines of steamers, all of whom have
facilities in New York Harbor not to be changed by any additional
of going to Albany, and the other proportion carried by tramps or out-
ng freight steamers. The entire number of the latter is 163, to 821 of
r, and the tonnage carried respectively is, of the latter 278,831 tons,
503,161 of the former. Applying this wholly to the tonnage brought
he canals and estimated to have been exported, the total possible ton-
8,831 tons. But it must also be borne in mind that of this number, say
ide steamers, those drawing over 20 feet of water excludes 101, and
ain only 62 of a capacity of 75,390 aggregate tons which could have
sibility availed themselves of the results of this project, against a total
2 tons that must have sought the present available channel of export.
rtainly a very unimportant item of commerce to warrant such an out-

We also deem that nature has created an insuperable objection to this change. The canals remain entirely closed for two hundred and ne days (taking an average of sixty-six years) and that during the very t season in which the crops are moved. The fall harvest ceases to be by this route in November, and begins again only on the first of the May; during this very important period the railroads alone have to be on. That this factor is a very serious one is indicated by the gradual n of the business of transportation in the State by the railroads. A few ll sufficiently indicate this:

	Tons.
ggregate tonnage conveyed by the canals was	4,247,853
ast an aggregate by Erie and Central railroads of	991,039
five times by canal over that by rail.)	
ggregate by canal was	5,557,692
ast Erie and Central railroads	3,264,700
ggregate by canal was	6,364,782
ast Erie and Central railroads	11,835,426
ggregate by canal was	5,664,056
ast Erie and Central	24,503,063
nal	5,246,102
il	32,378,097

ures are now reversed.

lroads convey six times more than canal, and the aggregate is 37,500,-gainst 5,000,000 in 1853. The tonnage by canal has hardly increased at that by rail is 3,200 per cent increase. Comment as to the respective merit of the two modes of transportation is superfluous.

ring, therefore, the very small proportion of the tonnage of the State sported by canal, the still smaller proportion which would be affected by

APPENDIX 5.

LETTERS AND RESOLUTIONS FILED WITH THE BOARD OF ENGINEERS BY T SECRETARY OF THE CHAMBER OF COMMERCE, ALBANY, NEW YORK.

LETTER FROM SECRETARY OF THE CHICAGO, ILLINOIS, COAL EXCHANGE

CHICAGO COAL EXCHANGE,
Chicago, December 16, 1890.

DEAR SIR: Your favor of December 12, in reference to the Chicago Coal E change sending a delegate to the public hearing given by the Board of E gineers at City Hall, Albany, January 6, 1891, duly received and noted. O board of directors will hold their next meeting December 23, and I will th lay your letter before them, and will notify you of such action as they may ta in the matter.

There is no doubt in my mind that the improvement contemplated would of vast benefit to the entire western country, and I will endeavor to present t matter to our board of directors in as favorable a light as possible.

Yours truly,

W. B. MATHER,
Secretary.

FRED. F. WHEELER, Esq.,
Secretary, Chamber of Commerce, Albany, N. Y.

LETTER FROM SECRETARY OF THE FARGO, DAKOTA, BOARD OF TRADE.

OFFICE OF THE BOARD OF TRADE
OF THE CITY OF FARGO, N. DAK.,
December 16, 1890.

MY DEAR SIR: While thanking you on behalf of the board for the kind invit tion in your letter of the 11th instant, I regret to state that the circumstanc are such as to make it impracticable for any of the members to attend the pr posed meeting. However, the board fully appreciates the desirability and impo tance of the object in view, and wishes the project every success.

Faithfully yours,

C. D. HOLMES.

FRED. F. WHEELER, Esq.

tance, or reduce the freight charges between the Northwest and the seaboard. If the proposed deepening the channel of the Hudson River will effect this object the enterprise will receive our support, and our association will coöperate with yours and others in securing so desirable an end.

Yours truly,

C. C. STURTEVANT,
Secretary.

F. F. WHEELER,
Secretary, Chamber of Commerce, Albany, N. Y.

LETTER FROM SECRETARY OF THE MANKATO, MINNESOTA, BOARD OF TRADE.

OFFICE OF MANKATO BOARD OF TRADE,
Mankato, Minn., December 22, 1890.

DEAR SIR: This board acknowledges receipt of your invitation to attend the meeting of the Board of Engineers on January 6, and instructs me to say that while it will probably not be practicable for us to send a delegate to that meeting, yet we heartily sympathize with you, and with all others who are endeavoring to improve the internal navigation of this country, believing that commerce is one of the most important factors in promoting the wealth and importance of any nation, and also that justice requires that our interior towns should, so far as nature has made it possible, be granted the same commercial advantages as those enjoyed by the seaport cities.

Yours very truly,

CHAS. A. CHAPMAN,
Secretary.

FRED. F. WHEELER,
Secretary.

RESOLUTIONS ADOPTED BY THE DAVENPORT, IOWA, BUSINESS MEN'S ASSOCIATION.

THE DAVENPORT BUSINESS MEN'S ASSOCIATION,
Davenport, Iowa, December 23, 1890.

DEAR SIR: At regular meeting of our association held last evening the following resolutions were adopted unanimously:

"Whereas efforts are being made to have deepened the channel of the Hudson River between the cities of New York and Albany, and a commission of Army officers is about to examine and report on the feasibility of the project; and

"Whereas the accomplishment of such work, if so done as to admit the passage on such portion of said river of vessels of 3,000 tons burden, would operate to the great advantage of the West: Therefore,

"*Resolved*, That the Business Men's Association of Davenport, Iowa, most heartily indorses this project."

HENRY T. DENISON,
Secretary.

FRED. F. WHEELER, Esq.,
Secretary, Chamber of Commerce Albany, N. Y.

RESOLUTIONS OF DETROIT, MICHIGAN, BOARD OF TRADE.

DETROIT BOARD OF TRADE,
Detroit, Mich., December 23, 1890.

Whereas the Secretary of War has appointed a commission of three United States engineers to examine and to report a plan and estimates of the cost of deepening the channel of Hudson River between Coxsackie and Troy, a distance of about 20 miles; and

Whereas the Board of Trade of the city of Detroit regard existing water ways and all water communication between the West and the East as great regulators to the cost of transportation both ways, and that without doubt they insure cheap transportation rates on all products moving toward the seaboard: Therefore be it

Resolved, That if the proposed improvement is found to be practicable and expedient, this association heartily favors the deepening of the Hudson River channel between the points named sufficient to admit the passage of ocean crafts of 3,000 tons tonnage as far as Troy, N. Y., the terminus of the Erie Canal.

[SEAL.] GEO. M. LANE,
Secretary.

LETTER FROM PRESIDENT AND SECRETARY OF CLEVELAND, OHIO, BOARD OF TRADE.

BOARD OF TRADE ROOMS, ATWATER BLOCK,
Cleveland, Ohio, December 27, 1890.

DEAR SIR: Your favor of 12th instant has been received and carefully noted. While fully appreciating the importance to the great West of deepening the channel of the Hudson River, and favoring the project, as far as our influence may go, it is not possible for us to send a delegate to your "public hearing" on January 6, 1891. We are greatly obliged to you for advising us of your meeting.

WM. EDWARDS,
President.
A. J. BEGGES,
Secretary.

FRED. F. WHEELER, Esq.,
Secretary Chamber Commerce, Albany, N. Y.

LETTER FROM PRESIDENT OF THE BURLINGTON, IOWA, BOARD OF TRADE.

BOARD OF TRADE,
Burlington, Iowa, December 29, 1890.

DEAR SIR: Your favor of the 11th instant to the secretary of the Burlington Board of Trade has been handed to me. The subject of the improvement of water transportation by the use of rivers, lakes, and canals is one which always enlists the earnest interest of the shippers of the great Northwest. We understand how greatly this section of the country is dependent upon the water routes for the reasonable rates of toll which we pay to the seaboard. As residents of a city upon the great Mississippi River, the Burlington Board of Trade fully appreciate the benefit of the improvement of our rivers. We recognize the fact that the cost of transportation on the lines of railroad which parallel our water courses are much less than on other lines of railroad, and that this result is produced entirely by reason of the regulation which the water courses affect in the cost of transportation. Under these circumstances we heartily indorse any worthy effort for the improvement of our navigable streams. There certainly is no river in the United States which should receive greater consideration than the Hudson River, and the deepening of the channel proposed, so as to admit of the passage of larger vessels, is a matter which should enlist the earnest support of the producers and shippers of the entire Northwest.

I have not been able to find a delegate who can spare the time to attend the public hearing to be given by the Board of Engineers at Albany on the 6th of January, but I have to report that the subject meets with the approval of all our people and I am sure that if we had a representative present he would give the matters words of hearty support and encouragement.

Respectfully,

PHILIP M. CRAPO,
President.

FRED. F. WHEELER,
Secretary Chamber of Commerce, Albany, N. Y.

LETTER FROM PRESIDENT OF THE ST. PAUL, MINNESOTA, CHAMBER OF COMMERCE.

ST. PAUL CHAMBER OF COMMERCE,
St. Paul, Minn., January 2, 1891.

DEAR SIR: Your kind invitation received. We shall hardly be able to be with you, in a body—or the body—only in spirit.

Stick to water, deep water; and receive the benediction of St. Paul in your efforts.

Wishing you a good time, and good success, we remain,

Yours truly,

DANIEL R. NOYES,
President (for the Chamber of Commerce of St. Paul).

SECRETARY CHAMBER OF COMMERCE,
Albany, N. Y.

LETTER FROM SECRETARY OF THE CHICAGO, ILLINOIS, BOARD OF TRADE.

BOARD OF TRADE OF THE CITY OF CHICAGO,
SECRETARY'S OFFICE,
Chicago, January 2, 1891.

DEAR SIR: Referring to your esteemed favor of the 11th instant, which was duly acknowledged and referred to the appropriate committee of this board.

I am directed by vote of the board of directors to express approval of that body of the plan described in your communication to deepen the Hudson River from Coxsackie to Troy. This board appreciates the importance of the canal and river system of your State to the commerce of the West and Northwest, and its importance as a regulator to the cost of transportation.

The board, however, regrets that, owing to the multiplicity of duties and interests which demand its attention, particularly at the beginning of the new year, it is not possible to accept your kind invitation and send a delegate to the public hearing in the City Hall, Albany, on January 6, next.

Very respectfully,

GEO. F. STONE,
Secretary.

FRED. F. WHEELER, Esq.,
Secretary Chamber Commerce, Albany, N. Y.

LETTER FROM THE MAYOR OF THE CITY OF NEW YORK.

MAYOR'S OFFICE,
New York, January 2, 1891.

MY DEAR SIR: I regret exceedingly that the nature of my present engagements in this city precludes my acceptance of the courteous invitation extended to me by the Albany Club to be present at the reception to be tendered by it to the visiting delegates to the hearing before the United States Commission upon the Hudson River deepening.

I am pleased, though, to have this opportunity of expressing my hearty approval of this or any other undertaking which may tend to the improvement of our State commerce.

Truly yours,

HUGH J. GRANT.

J. HOWARD KING, Esq.,
President, etc., Albany, N. Y.

LETTER FROM THE MAYOR OF OSWEGO, NEW YORK.

MAYOR'S OFFICE,
Oswego, N. Y., January 3, 1891.

GENTLEMEN: Yours extending to me an invitation to attend the hearing before the United States Commission upon the deepening of Hudson River at hand, and contents noted.

Syracuse, N. Y., January 5, 1891.

MY DEAR SIR: Your kind invitation for to-morrow evening is received. I regret that I can not be present, but desire to express great interest in t work you hope to accomplish.

Respectfully, yours,

E. B. JUDSON.

Mr. J. HOWARD KING.

LETTER FROM THE MAYOR OF ORANGE, NEW JERSEY.

MAYOR'S OFFICE,
Orange, N. J., January 5, 1891.

DEAR SIR: Your kind invitation to be present at a reception to the visiti delegates to the hearing before the United States Commission upon the Huds River deepening duly received.

If I could be present with you it would be my pleasure to express my appro of any effort which has in view the furtherance of increased facilities for tra portation between New York and Albany, or I might rather say New Jersey a Albany, for there is no doubt but that New Jersey is desirous of having an i crease of its cordial intercourse with your city.

Very truly yours,

HENRY H. TRUMAN.

J. HOWARD KING, Esq.,
President Chamber of Commerce, Albany, N. Y.

LETTER FROM THE MAYOR OF CLEVELAND, OHIO.

CITY OF CLEVELAND, OHIO, EXECUTIVE DEPARTMENT,
January 5, 1891.

DEAR SIR: I am in receipt of the courteous invitation to attend a reception visiting delegates for Tuesday evening, 6th instant, for which please acce thanks.

It will be impossible for me to be with you in person, but I can heartily expr a wish that the efforts being made to secure the coöperation of the Federal Go ernment in providing a deep-water channel right up to the wharves of Alba may prove successful.

The authorities should keep pace with the marvelous progress in commer all over our wonderful country, by a liberal provision in water-way improvemer

ing before that time, on account of the absence of members in different parts of the lakes looking after various interests. The importance of improvements in the shallow parts of the channel of the Hudson River is recognized here, and after a talk with the members of the board of directors I am satisfied that, had there been a possibility of a meeting in time, our association would certainly send a representative to the Albany conference. There was delivered from the Northwest at Buffalo during the season ended last month 118,958,102 bushels of grain of all kinds, for shipment to the seaboard, principally by the way of the Erie Canal. From this it can readily be seen that the canal and river system of your State renders a great service to the Northwest as a regulator of transportation rates, and it is unfortunate that we can not have a representative at the conference on the 6th instant to more fully discuss this matter.

Yours, truly,

GEO. P. MCKAY,
Secretary and Treasurer.

FRED. F. WHEELER,
Secretary Chamber of Commerce, Albany, N. Y.

o

LOWELL
BOSTON
MASSACHUSETTS
SPRINGFIELD
Connecticut River
PROVIDENCE
HARTFORD
RHODE I.
NORWICH
NEW LONDON
NEW HAVEN
Block Id
ATLANTIC OCEAN

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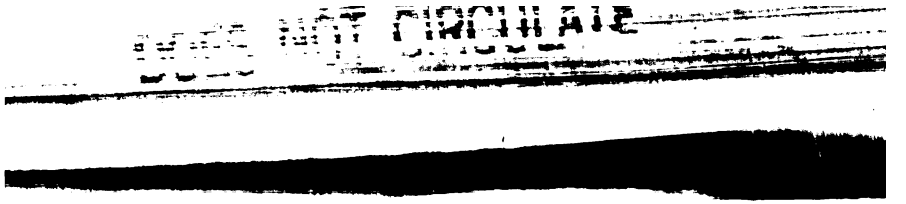
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52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { EX. DOC. No. 24.

OBSTRUCTION TO NAVIGATION OF THE GREAT LAKES.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING

A copy of a letter from the Secretary of the Cleveland Vessel Owners' Association, in reference to the obstruction to navigation of the Great Lakes.

JANUARY 5, 1892.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 8, 1891.

SIR: Upon the recommendation of the Chief of Engineers, I have the honor to transmit herewith, for the information of the proper committee, a copy of a letter addressed to him by Mr. George P. McKay, Secretary of the Cleveland Vessel Owners' Association, in regard to the necessity of provision by the Government of adequate means for discovering, locating, and promptly removing obstructions that may exist in or near the fairways and regular courses of vessels on the Great Lakes and their connecting waters.

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

LETTER OF MR. GEORGE P. McKAY, SECRETARY OF THE CLEVELAND VESSEL OWNERS' ASSOCIATION.

CLEVELAND, OHIO.

DEAR SIR: The Cleveland Vessel Owners' Association takes pleasure in acknowledging receipt of your letter of September 10, relative to the removal of wrecks and other obstructions to navigation, and reciting the laws that now provide for clearing the fairways of wrecks, and is pleased to recognize the disposition of your Department to take account of any information furnished, and to act thereon so far as the provisions of law permit.

It is in this regard especially that the association wishes to represent to the proper department of the Government the necessity for further provisions for removing obstructions. The acts quoted in your letter relate entirely to wrecks, while the much more numerous and serious obstructions are not wrecks but reefs, shoals, and bowlders, the exist-

ence of which has been developed by the prevailing low water of the lakes, and in particular by the greatly increased draft and tonnage for which the present type of lake vessels is designed.

The developments of lake shipbuilding of late years are no doubt well known to the Chief of Engineers from the reports of the several engineer officers in charge of lake harbors, and need not be dwelt upon.

The association believes that what is especially needed at this time is proper provision for discovering, locating, and summarily removing all obstructions that may exist in or near the fairways and regular courses of vessels, and it would seem, in view of the costly casualties constantly occurring, that great changes must have taken place in the lake and channel bed banks. These localities are multiplying every year, and have in part been examined by our own means and at our own cost for the protection of the immese values at risk, both in vessel and cargo; but it is evident that so great a burden ought not to be imposed upon vessel owners, and in fact that only a properly equipped Government organization is capable of dealing with the matter with the necessary thoroughness and accuracy.

Among the important points where great losses have occurred from delays and cost of repairs are the following:

IN LAKE ERIE.

(1) The waters south of the dummy light on Pointe Pelee are now recognized as dangerously shallow, the point having extended so that vessels are compelled to sail 4 or 5 miles south of the course laid down on the chart, where so little as 18 or 20 feet of water is found, instead 5 or 6 fathoms as shown.

(2) The waters between Catawba and South Bass islands are full of foul bottom, and many casualties have occurred there.

(3) Off Colchester or Little Point is a shoal of bowlders three-eighths to one-half mile south of the one shown on the chart, and there are wrecks in that vicinity not accurately located.

The *Grecian* tore her bottom out on this shoal, at a cost of $15,000 or $20,000 for repairs.

(4) There is a range of rocky bottom between the Detroit River Light and Bois Blanc Island.

(5) Between Lime Kiln Crossing and Ballards Reef are obstructions not shown on the charts and not yet accurately located.

(6) The Grosse Pointe Flats are a very serious obstruction, incessant grounding and delay occurring there, and there are also obstructions in the open lake as well as near the mouth of the canal flats.

It cost the *Chemung* $4,000 or $5,000 to replace a wheel and repair damage to her bottom, caused by striking at a point 4 miles northeast of the Grosse Pointe Light-ship.

(7) There are shoals and obstructions in the St. Clair River at several points, particularly below Marine City, Stag Island, and near Port Huron.

(8) The shoals in the lower end of Lake Huron are difficult to avoid and should be carefully surveyed and removed.

(9) The St. Marys River is full of obstacles, large and small bowlders, etc., the removal of which would greatly facilitate the navigation.

There are numerous other localities, such as the Mackinac, the vicinity of Waugoshance, the several passages into Green Bay, the north end of Green Bay, etc., where from time to time vessels strike in unexpected places.

These disasters are almost invariably costly, in view of the size, weight, and speed of the modern type of lake vessels, and their frequent occurrence inflicts heavy losses on vessel owners, which, in view of the responsibility of the United States Government for the protection and furtherance of lake commerce, ought not longer to continue.

In many cases the dangerous obstructions are of small extent, and could be readily taken out by blasting. In others the sand and gravel shoals could easily be dredged away and would not probably re-form. In still others it might be found more economical, and possibly more advantageous, to buoy or light the obstruction than to remove it; but in any case a thorough examination is required to determine the best course to pursue.

What the association at this time believes to be imperatively needed is the construction of a vessel specially adapted to the examination of all suspicious and dangerous localities, the survey of the obstructions, and the summary removal of rocks, bowlders, etc., that a proper survey and blasting outfit could readily deal with.

Consideration has been given the subject, and the cost of such an equipment is estimated at about $100,000, viz, $85,000 for the vessel and $15,000 for the equipment, with an annual cost of maintenance of $15,000 or $20,000.

The general description, etc., of the vessel the association has in mind are as follows: Length, 160 feet; width, 30 feet; draft, 9 feet; double bottom; twin screws; ample power of boiler and engine; decks open at each end, with steam capstans and steam derrick hoists bow and stern; a suitable wrecking pump, diving outfit, and blasting and mechanical appliances of the various kinds needed, with ample quarters for ship's company, survey party, and other necessary employés.

There would also be needed adequate boat facilities, including particularly two steam launches for sweeping the bottom, rafts for mooring over rocks to examine them, etc.

Such a vessel, with a suitable survey and working party on board, could perform inestimable service to the lake-vessel interests, and save yearly an immense sum in damage and repairs, besides furnishing information for correcting the lake charts, which are now in many respects lacking in recent information.

The association desires to secure the coöperation of the Chief of Engineers in this important matter, and since the Engineer Department of the Army is in charge of the improvement of harbors and navigation generally, and of the lake charts, it is asked that you include in your estimates to Congress a recommendation for the procuring of a survey and wrecking plant of the character above described, to be operated under the direction of your Department.

In addition to the vessel and equipment there should be a fund for keeping it in service throughout the year, when able to move, and with a contingent fund for removal of rocks and reefs and shoals by dredging and blasting as rapidly as they can be definitely located and examined.

Trusting that our endeavors in this direction may approve themselves to your judgment and official sanction, and hoping that you may afford us an opportunity for full explanation of our needs,

I am, general, very respectfully,

GEO. P. MCKAY,
Secretary.

General CASEY,
Chief of Engineers, U. S. A., Washington, D. C.

O

52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc. No. 25.

DAM NEAR LOUISA, KENTUCKY.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING,

With a letter from the Chief of Engineers, report of Board of Engineers on dam in Big Sandy River near Louisa, Ky.

JANUARY 5, 1892.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 8, 1891.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, dated November 20, 1891, inclosing a copy of a report of a Board of Engineer Officers appointed to consider and report upon the subject of substituting a movable dam in the Big Sandy River, near Louisa, Ky., in lieu of a dam of a fixed type at that site, which had already been authorized and was under construction at the time of the appointment of the Board.

After full and careful consideration of the matter, the Board is of opinion that a movable dam is best suited for this site, and recommends its substitution for that previously authorized.

In event of the recommendation of the Board being favorably considered by Congress, the Chief of Engineers reports that a further appropriation of $76,000 will be necessary to construct such a type of dam.

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., November 20, 1891.

SIR: At the request of Hon. Thomas H. Paynter, M. C., and others interested in the navigation of the Big Sandy River, Kentucky, a Board of Officers of the Corps of Engineers was constituted by the Secretary of War to consider and report upon the subject of the dam to be built in the Big Sandy River, near Louisa, Ky., and I now have the honor to submit the accompanying copy of the report of the Board, dated November 10, 1891.

A dam of the fixed type had already been authorized and was und construction at this site when the interested parties requested that movable dam be substituted for the fixed dam. The subject report on by the Board is in regard to the character of dam that should b built. It will be seen that the Board has given the subject full an careful consideration, and is of the opinion that the best type of da for the site at Louisa is a movable dam of needles supported by trestle and recommends the substitution of that type for the fixed dam now i course of construction. The estimated cost of constructing the mo able dam proposed is $93,000, and as there are only $17,000 on hand available for the fixed dam, a further appropriation of $76,000 will b necessary if the views of the Board are to be carried out.

I concur in the recommendation of the Board, and recommend tha the report be transmitted to the Speaker of the House of Representa tives for the information of the Committee on Rivers and Harbors.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engineers.

Hon. REDFIELD PROCTOR,
Secretary of War.

REPORT OF BOARD OF OFFICERS OF THE CORPS OF ENGINEERS O DAM IN BIG SANDY RIVER, NEAR LOUISA, KENTUCKY.

NOVEMBER 10, 1891.

GENERAL: The Board of Officers of the Corps of Engineers, consti tuted by Special Orders No. 31, from your office, May 20, 1891, "to con sider and report upon the subject of the dam to be built in the Bi Sandy River," near Louisa, Ky., have the honor to submit final report as follows:

A dam had already been authorized, and was under construction, o the fixed type; and while this construction was going on the subject o the dam was referred to the Board because of a communication addressed to the Hon. John Sherman by Mr. E. Nigh, of Ironton, Ohio, dated May 2, 1891, and referred by the Senator to the Secretary of War. In Mr. Nigh's communication objection was made to the type of dam then under way, and preference was expressed for a "wicket dam instead of the kind now being built," and a request was made "to have the matter in vestigated fully before proceeding with the work." This communication was referred for consideration and report by this Board, and thus the Board are to consider and report in regard to the kind of dam which should be built at the site in question.

In accordance with the terms of the order, the Board assembled at Louisa, Ky., on the afternoon of June 2, and on the next day, at 10 a. m., in the court-house at Louisa, heard the statement of parties in interest, some in favor of abandoning the construction of the fixed dam, then under way, and substituting therefor a movable dam, and others in favor of carrying the construction of the fixed dam to completion.

The public meeting was quite large, composed of representatives from Catlettsburg, Louisa, and other towns on the river and its forks, as well as parties on the Ohio River having business relations with the river, and the interest shown in the subject before the Board was unusually great. Opportunity was given for very full discussion. Those speaking

in favor of the movable dam were unanimous in expressing their preference for building no dam at all, unless the dam be movable, and expressed apprehensions as to the following points:

(1) The lock can not be operated rapidly enough to pass the rafts as they arrive, whereby delay will be caused, to the detriment of the rafting interests.

(2) Because of the large quantities of sand moving, the pool will so fill up as to be useless, and for the same reason the exit from the lock below will so fill in with sand as to prevent the passing of rafts even during a great part of the rafting stages.

Those opposed to the change of type desire the work to be carried on as at present authorized, because—

(1) The dam now under construction can be completed and made available at an earlier period than a dam of the changed type can be built.

(2) The system of fixed dams will cost less than a system of movable dams, and consequently the river will be sooner improved with the periodic appropriations made for the work.

These parties dissent from the parties opposed in regard to the apprehensions of serious evils inherent to the fixed type when applied to the Big Sandy River.

With this report, and returned with the original case are a number of communications in which parties in interest have expressed views on both sides of the question at issue and to which attention is invited.

This first dam, while one in a series of similar structures, is specially intended, in advance of the construction of others in the series, to provide a pool for the harboring of loaded barges during low water. These boats can not get out of the pool during low water because of the lack of depth below the lock and out to the Ohio River. A rise from the upper river must then be awaited. The rises from the upper river bring large numbers of rafts, and it would then come about that the boats accumulated in this harboring pool and the arriving rafts would all be seeking passage through the lock during these periods of high water. To what extent this demand would tax the capacity of the lock in certain periods of time can not be determined from any data now at hand. To assume how many barges would be harbored in the pool at any one time would be mere guesswork. Information in regard to the number of rafts arriving per hour for any defined period is very indefinite. Attention is invited to the following tabular statement:

Timber output of Big Sandy River, 1882-'90.

Year.	Cubic feet.	Number of lockages of 8,000 cubic feet each.	Number of days river was at rafting stage at Louisa, Ky., 6 to 15 feet.	Remarks.
1882	5,524,000	690	.....	
1883	4,695,000	587	10	Record last half year only; no record for first half year.
1884	6,226,920	778	80	
1885	4,344,565	543	68	
1886	8,171,360	1,021	143	
1887	9,689,080	1,211	65	
1888	5,325,210	665	29	Record for first half year only; no record for last half year.
1889	4,555,000	569	182	
1890	*4,813,725	602	142	

* Given in reports as 107,063 tons, including cross ties.

the higher stages. Necessarily, then, this arresting of the downstream movement of sand will be very much less for a movable dam than for a fixed one, and for the former type of dam will attain a maximum before the navigation and the availability of the pool for harboring boats are interfered with to the extent which would result from the construction of a fixed dam.

With a movable dam, navigation being through the dam and not through the lock at all the higher stages, as the river falls it may be easily determined whether there has been any deposit of sand to interfere with the passage through the lock; if such be found, the deposit can be removed and the lock put in perfect condition for use before the dam need be closed; thus navigation will not be prevented for an instant.

The practical use of a movable dam, as indeed of any dam, involves a supply of water to cover the leakage through it when closed, otherwise the maintenance of the pool to its normal or even to a useful level will be impracticable. Measurements of the discharge of the river at stages varying from 16.2 feet on the gauge down to 1.98 feet on the gauge have been made, and a tabulation of these measurements is inclosed with this report. In a wicket dam the spaces between the wickets are 4 inches wide. Under the conditions at Louisa the discharge through one of these spaces at low water would be about 52¼ cubic feet per second if the wickets were as high as at dam No. 5, Great Kanawha River.

If we assume a weir with wickets 8 feet high, the discharge through one space would be about 24¼ cubic feet per second. If wickets be 4 feet from center to center throughout, this leakage through the spaces per foot of pass would be about 13 cubic feet, and per foot of weir would be about 6 cubic feet per second. Assuming for the Louisa dam 124 feet for the pass and 176 feet for the weir, there would be required about 2,680 cubic feet per second to supply this leakage; that is, an amount equal to the discharge of the stream at the gauge reading of 5 feet, or somewhat over.

The spaces between the wickets, however, are covered at need by scantlings called joint covers, laid cornerwise upon them. An actual experience with a discharge measurement on the Great Kanawha River has given the following data: There are 62 wickets in the pass and 53 on the weir; those in the pass are 13 feet vertical height from the sill to the top of the wicket, and inclined at an angle of 15½°; similarly those on the weir are 5 feet high, and inclined to an angle of 12°. The water below the dam stood 1.64 feet above the sill of the pass. The pool was maintained at fifteen-hundredths of a foot below the tops of the wickets. Under these conditions the discharge through each space between the wickets of the pass would be nearly 52 cubic feet per second, and through each space between the wickets on the weir about 12 cubic feet; that is, it would require 3,860 cubic feet per second to supply the leakage through these spaces of Dam 5. Joint covers had been placed over 60 of the spaces in the pass, and over 21 spaces on the weir. The discharge of the stream was measured below the dam and found to be about 1,130 cubic feet per second. This measurement was taken below the Elk River, and assuming the discharge of that tributary as low as 30 cubic feet, the balance of 1,100 cubic feet maintained the pool of Dam 5 to the level and under the conditions stated; that is, this partial covering reduced the amount necessary to maintain the pool to 30 per cent of that necessary to supply the discharge through all the spaces if uncovered. There were 2 spaces in the pass and 32 on

the weir uncovered. The estimated discharge through these spaces was about 488 cubic feet per second, leaving 612 cubic feet as the leakage through the joint-covered portion of the dam, and between the wickets and the sills of that portion not joint-covered. Omitting consideration for the time of the leakage under the wickets having no joint covers, the leakage through the joint-covered portion of the dam would be less than $1\frac{3}{4}$ cubic feet per foot of the aggregate length of the joint-covered portions of the pass and weir. But the leakage under the wickets is not to be neglected, so that the actual leakage per foot of the aggregate lengths of joint-covered wickets is still less than that given. Then, again, the leakage per foot of weir in any condition is much less than for the pass; consequently, if the weir were joint covered throughout, the average leakage per foot would on that account be still further reduced.

For the site of Louisa, where the aggregate length of the pass and weir would be, say, 300 feet, the data above noted permits us to assume with much assurance of correctness that the leakage through the dam, if joint covered, would not much exceed $1\frac{1}{2}$ cubic feet per second, and the pool yet remain with a useful available depth throughout, say a leakage of 500 cubic feet per second, equal to the discharge for the gauge reading of 2.8 feet. The water was below this stage for past years as follows:

Months.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
January	(*)	0	0	0	0	5	0	0	0
February	(*)	0	0	0	0	1	0	0	0
March	(*)	0	0	0	0	0	0	0	0
April	(*)	0	0	0	0	0	0	0	0
May	(*)	0	0	0	0	3	0	0	0
June	(*)	7	5	0	6	18	0	0	0
July	(*)	22	31	8	28	(*)	0	3	.....
August	21	22	19	6	30	(*)	1	0	.....
September	30	30	30	29	30	(*)	15	0	.....
October	26	31	29	31	31	(*)	0	1	.....
November	10	30	0	17	30	(*)	0	0	.....
December	20	14	0	0	27	(*)	0	0	.....
Totals	.....	156	114	91	182	.....	16	4	.....

* No reading.

It is believed that by means not difficult of application the leakage could be reduced to 1 cubic foot per foot of dam, say to 300 cubic feet per second, equal to the discharge for the gauge reading of $2\frac{1}{2}$ feet, nearly. A lower stage than this obtained in past years as follows:

Months.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
January	(*)	0	0	0	0	2	0	0	0
February	(*)	0	0	0	0	1	0	0	0
March	(*)	0	0	0	0	0	0	0	0
April	(*)	0	0	0	0	6	0	0	0
May	(*)	0	0	0	0	3	0	0	0
June	(*)	3	2	0	3	17	0	0	0
July	(*)	20	29	7	26	(*)	0	0	.....
August	21	22	16	6	29	(*)	0	0	.....
September	30	30	30	28	30	(*)	10	0	.....
October	25	31	29	31	31	(*)	0	1	.....
November	8	30	0	17	30	(*)	0	0	.....
December	17	13	0	0	17	(*)	0	0	.....
Totals	.....	149	106	89	166	.....	10	1	.....

* No reading.

The estimated discharge through the spaces between needles in the aggregrate is about one-fourth the estimated discharge through the spaces between the wickets for the same length of dam or for a dam near Louisa, say about 700 cubic feet per second. If the discharges through the needles be reduced by the application of additional cover even no more in proportion than the simple placing of joint covers has been found to decrease the discharge through Dam 5 of the Great Kanawha improvement, the lowest discharge so far measured for the Big Sandy will suffice to maintain the pool to a useful height. This additional cover, in the opinion of the Board, is easily feasible.

It is observed that the lowest gauge reading so far reached this year and for which measurement of discharge has been made is not so low as has been recorded in past years; the low water of 1883 was 1.23 feet lower. How much less the discharges were in the lower recorded stages of past years can not be ascertained or even estimated. There are indications that the bottom of the stream has filled somewhat with sand in these latter years, and a result of this filling would be that lesser discharge would correspond to higher gauge reading. So that, though the gauge reading has been as much lower as stated, it does not prove that the discharge has been correspondingly low. The tabulation of the gauge record indicates an obliteration of the lesser gauge readings as time progresses; such would actually result from filling of the bottom.

After full and careful consideration of all the elements determining a decision, the Board are of opinion that the best type of dam for the site at Louisa is a needle dam, and they recommend the substitution of that type for the fixed dam. It is further recommended that the height of the dam from the sill of the pass to the top of the wickets be fixed at 13 feet, and that the dam be built across the river opposite the tail wall of the lock as is done in our practice, leaving all other details to be wrought out by the officer in charge.

The needle dam for the site near Louisa will cost somewhat less than a wicket dam.

In 1879 the recommendation was made by the officer in charge to build a fixed dam, with a view of ultimately turning the fixed dams into movable ones. Since that time experience has been had in this country with the operation and action of movable dams, and the Board are of opinion that the trial now made should be with that kind of dam.

With this report are inclosed a number of letters and papers addressed to the Board, and a list of them is also herewith.

Estimated cost of constructing a movable dam of needles, supported by trestles, Poirée system, on Big Sandy River, near Louisa, Ky.: Navigable pass, 125 feet; weir, 175 feet; vertical height of needles of pass, 13 feet; of weir, 8 feet.

PASS AND WEIR.

Fixed parts:	
Stone sill, 223.75 cubic yards, at $20	$4,475.00
Rear trestle stone, 102.5 cubic yards, at $16	1,640.00
Squared stone, 839 cubic yards, at $7	5,873.00
Paving stone, 315 cubic yards, at $10	3,150.00
Concrete stone, 2,688 cubic yards, at $7	18,816.00
Wrought-iron tie-rods, etc., 13,200 pounds, at 4 cents	528.00
Cast-iron anchors, 11,000 pounds, at 4 cents	440.00
Trestle journal-boxes, 17,625 pounds, at 7 cents	1,233.75
Bolts, nuts	300.00
	36,455.75

Cofferdam	15,00
	23,00
Cost of foundation, pass and weir	36,45
Cost of abutment and pier	12,00
Cost of movable parts above foundation	14,50
	85,96
Taking down old abutment, 1,100 cubic yards, at $1	$1,10
New upper gates	3,00
Excavating upper approach, 10,000 cubic yards, at $1	10,00
Cutting down upper mitre and headwall 6 feet, 386 cubic yards, at $2.50	96
Paving bank about abutment	8,00
	104,02
Deduct value of 2,000 cubic yards stone in present abutment and in yard, at $5.50	11,00
	93,02

The cause of the delay in sending this report has been the necess of obtaining certain information as to the discharge of the river at l stages, and this could only be had by waiting for the river to fall. tabulation of the discharge measurements is herewith.

WM. P. CRAIGHILL,
Colonel, Corps of Engrs
D. W. LOCKWOOD,
Major of Engineers
THOMAS TURTLE,
Captain, Corps of Engineers

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { EX. DOC. No. 26.

WATER WAY BETWEEN NEW RIVER AND SWANSBORO, NORTH CAROLINA.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING

A copy of a letter from the Chief of Engineers in reference to the appropriation for the improvement of the water way between New River and Swansboro, N. C.

JANUARY 5, 1892.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 8, 1891.

SIR: Referring to the appropriation of $5,000 made in the river and harbor act of September 19, 1890, for the improvement of the water way between New River and Swansboro, N. C., I have the honor to transmit herewith, for the information of the proper committee, a copy of a letter from the Chief of Engineers, dated November 24, 1891, reporting the action of the Engineer Department in the premises in view of the inclosed copy of the act of the legislature of North Carolina, which is referred to in the communication of the Chief of Engineers.

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., November 24, 1891.

SIR: I have the honor to state that in compliance with a requirement of the river and harbor act of August 11, 1888, an examination of the "waterway between New River and Swansboro, N. C.," was made by Capt. W. H. Bixby, Corps of Engineers, who, in report dated March 13, 1889, stated that it was worthy of improvement. This report was transmitted to Congress, and an appropriation of $5,000 for the improvement of the water way was made in the river and harbor act of September 19, 1890.

and the owner of said land shall likewise select two freeholders of the same county, who shall ascertain the value of said land, they first deducting the enhanced value of adjoining lands which may belong to the owner of said lands by the establishment of such steamboat landing or by the opening up for navigation of such canal, and by adding any particular loss or damage; and if these four assessors can not agree, they shall call in a fifth such freeholder, and upon the payment, or tender of payment, of the amount so assessed by the president, the title of the land so appraised shall thereby vest in the said corporation: *Provided*, That either party may appeal from the decision of said appraisers to the superior court of the county wherein the land lies upon the question of the amount assessed: *And provided further*, That no more than one acre of land at any one landing shall be liable to be so condemned for the purposes of a warehouse and landing.

SEC. 6. That the president and directors shall have power at any time to borrow money upon the lands of the company and to secure the same by mortgage or other legal assurance.

SEC. 7. That the said company shall have the exclusive right to convey and transport freight and passengers over and along the waters of said sounds; that is to say, from what is commonly called the head of the sound, in New Hanover, northwardly and return to the waters of New River, in Onslow County, and thence on to Swansboro by steamboats and sailing vessels, and at such rates as said company shall prescribe: *Provided*, That said company shall open a connection, whenever necessary, between the waters of said sounds by canal sufficient to carry into effect the objects of this charter.

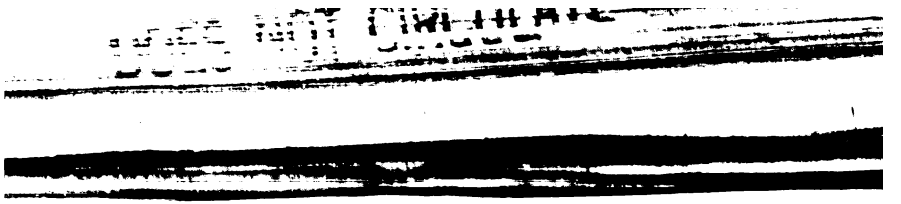
SEC. 8. That said company shall have the power and authority to construct and open a ship canal connecting the waters of Wrightsville Sound, or Masonboro Sound, with the waters of the Cape Fear River, and to this end may use the creeks and water courses at all intermediate points, and may seize and cause to be assessed all lands necessary therefor, under the restrictions and provisions contained in section five of this chapter, and shall have power to fix the tariff of tolls for all vessels that said company may allow to pass through the same, and to demand and collect said tolls; and the said company shall have the exclusive right for the period of ten years, from and after the ratification of this act, to construct the canal aforesaid.

SEC. 9. That this act shall be in force from and after its ratification.

Ratified the thirteenth day of February, anno Domini, one thousand eight hundred and eighty-nine.

A true copy.

MASON M. PATRICK,
First Lieutenant of Engineers.



LYNNHAVEN BAY, VIRGINIA.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING,

With a letter from the Chief of Engineers, report of the examination and survey of Lynnhaven Bay, Virginia.

JANUARY 5, 1892.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 8, 1891.

SIR: I have the honor to inclose herewith a letter from the Chief of Engineers, dated November 20, 1891, together with a copy of a report from Lieut. Col. Peter C. Hains, Corps of Engineers, dated November 12, 1891, of an examination and survey for a breakwater to form a harbor of safety and refuge in Lynnhaven Bay, near Cape Henry, at the foot of Chesapeake Bay, Virginia, made by him in compliance with the provisions of the act of Congress approved March 3, 1891. The cost of such a breakwater is estimated at $1,555,538.

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., November 20, 1891.

SIR: I have the honor to submit herewith copy of report, with maps, dated November 12, 1891, upon examination and survey "for a breakwater to form a harbor of safety and refuge in Lynnhaven Bay, near Cape Henry, at the foot of Chesapeake Bay, Virginia," made by Lieut. Col. Peter C. Hains, Corps of Engineers, in compliance with provisions of act of Congress approved March 3, 1891.

The cost of a breakwater 4,500 feet long constructed of concrete blocks laid close and bonded together, upon a riprap base, with an ap-

proximate location as shown on the accompanying map, is estim
$1,555,538.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brig. Gen., Chief of Engin

Hon. REDFIELD PROCTOR,
Secretary of War.

EXAMINATION AND SURVEY FOR BREAKWATER FOR HARB
REFUGE IN LYNNHAVEN BAY, NEAR CAPE HENRY, AT FO
CHESAPEAKE BAY, VIRGINIA.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., November 12,

GENERAL: The act of Congress approved March 3, 1891, in r
to a breakwater at Lynnhaven Bay, is as follows:

Be it enacted by the Senate and House of Representatives of the United States of in Congress assembled, That the Secretary of War is hereby directed to cause e tion and survey to be made, and the estimated cost of improvement to be e for a breakwater to form a harbor of safety and refuge in Lynnhaven Bay, n Henry, at the foot of Chesapeake Bay, Virginia.

The survey was assigned to my charge by Department letter of 12, 1891. The field work was intrusted to Frank P. Kellogg, as engineer.

The oldest reliable survey of Lynnhaven Bay that could be ol was that made by the Coast Survey in 1853; the latest, that m 1889. Copies of these were placed at my disposal through the c of the superintendent, Mr. Mendenhall. The examinations made Kellogg were conducted chiefly with a view to determining the v and direction of the currents at the various stages of ebb and flo the character of the anchorage grounds to be covered by the pr breakwater, the probable erosive action of the waves on the sho and whether any filling has taken place on the anchorage grou the bay.

Owing to the difficulty of working without a steamer, and the amount of funds assigned for the work, the examination was thorough as it should be to locate with accuracy the proper si breakwater to form a harbor of refuge. Tidal observations were at a gauge established in Lynnhaven Creek for the entire mo August, with a view to determining the mean rise and fall. The servations show that during the month of August, 1891, the mean of the tides was 1.73 feet. The extreme range was 3.1 feet. T fers considerably from that determined by the Coast Survey fo and May preceding, the mean range for those two months bei feet. The extreme height of storm tides will perhaps exceed or high tide by about 3 feet.

The examinations show that there is good anchorage ground th out a large area of the bay. A comparison of the different s shows that no perceptible change has taken place in the botto but little change in the shore line. The law directing the surv for its chief object the making of an estimate of the cost of th struction of a breakwater for a harbor of refuge, and sufficien was obtained, it is believed, for that purpose.

The best location for such a work has only been determined a mately. Before the work of construction is undertaken a muc

xtended survey would be necessary for the purpose of determining rith greater accuracy the force and direction of the currents, the char-cter of the bottom, the force, direction, and duration of the most evere storms, and the best location to be given the work in order to nsure the maintenance of deep water at the anchorage, and not cause hoaling such as has taken place at the Delaware Breakwater.

The most violent storms come from the northwest and northeast. Tudged from the records of the Signal Bureau, there appears to be ut little, if any, difference in their duration and intensity, those from he northwest being quite as severe as those from the northeast. But or coasting vessels at sea a northwest wind is a fair one, and the sea s then comparatively smooth. Under ordinary circumstances a harbor s not needed in a northwest gale, but when the storm comes from the ortheast or east the wind has the full sweep of the Atlantic Ocean. The waves attain their maximum height and velocity of movement. The land is then on the lee and a source of danger. It is then that a arbor of refuge is chiefly needed. It is no unusual sight in a north-ast gale to see from 100 to 300 vessels at anchor in Hampton Roads, his being the nearest harbor.

It is reported that in the last thirteen years no less than one large hip, nine barks, one brig, four steamers, twenty-two schooners, and a arge number of small craft engaged in the fishing and oyster trade ave been lost or stranded on or near the shore of Lynnhaven Bay, the oss of these vessels and their cargoes being accompanied in some cases y loss of life. On February 3, 1886, the schooner *Anthea Godfrey* oundered in Lynnhaven Bay, and 11 persons were lost. March 18, 889, the bark *E. M. Pettingill* also went to pieces with the loss of all n board. It would thus appear that a harbor of refuge at Lynnhaven ay is demanded for humanity's sake no less than for commercial easons.

The distance from an anchorage in Lynnhaven Bay to the usual an-horage in Hampton Roads is about 20 statute miles. Rather than run o far off his course the captain of a vessel will frequently keep the sea nd take his chances, whereas if there was a harbor near by he would ake advantage of it and ride out the gale at anchor. It is also to be emembered that in a northeast gale, the weather being generally thick, he entrance to Hampton Roads can not safely be made even in day-ime without a pilot, and it is not always possible to get one. At night he entrance should not be attempted without a pilot, unless the master s familiar with it. It sometimes thus becomes necessary to anchor in ynnhaven Bay, but the anchorage, though good to hold on to, is only rotected on the south, a direction from which the severe storms do not ome.

A harbor of refuge at Lynnhaven Bay would be of especial value to he barges in which more than half of the coal tonnage is moved from he Chesapeake north. After leaving Hampton Roads there is no suit-ble anchorage for such craft until Assateague is reached, and shelter ere is denied to all but those of light draft.

It is not alone the commerce of Norfolk, Newport News, and Balti-nore that will be benefited, though that is large, but all the coasting rade between Northern and Southern ports.

A breakwater to form a harbor of refuge at Lynnhaven Bay should e so located as to give shelter chiefly from northeast gales. At the ame time it is desirable that it should also afford some cover from the orthwest. I have therefore located the structure, which is to be un-

derstood as an approximate location only, as shown on the acco ing chart. The easterly arm is made 3,000 feet in length, the w one 1,500 feet—a total length of 4,500 feet. This would give a s bor for a fleet of at least 300 vessels, and should it be found ne in the future to increase the area of anchorage room, it can e done by lengthening either arm of the projected structure.

The cost of a breakwater is determined by the details of its c tion, and in this respect there is great diversity in practice. It i times built as a random pile of stones called riprap, the slopes sides being those that they will naturally take under the actio waves. The Delaware Breakwater is a sample of this mode struction. Another method of construction is to form a mound rap with from 12 to 22 feet of water at mean low tide o upper surface as a foundation for a random pile of larger stones crete blocks. A third, is to form a mound as just described, a lay concrete blocks on it in regular order so as to form a solid m fourth, is to build up a solid mass of concrete or masonry from t tom. The third method is the one most generally adopted in constructions, as it is the most economical under nearly all stances.

The depth of water at the site of the Delaware Breakwater d differ materially from that at the site of the proposed breakw Lynnhaven Bay, and, as it has withstood the most severe sto years without serious impairment, it may safely be assumed tha ilar construction in Lynnhaven Bay would fulfill its object. The the Delaware Breakwater, however, amounted to about $550 pe foot, and a similar construction in Lynnhaven Bay would cost b less.

I estimate the cost of a breakwater at Lynnhaven Bay, cons in a manner similar to that in the Delaware, as follows:

	Cost per linear foot.
123 tons of riprap stone below 12 feet depth, at $2.25	
74 tons of riprap stone above 12 feet depth, at $3.25	

If constructed of blocks of concrete thrown into a random pi lar to the mole of Algiers, the cost would be as follows:

	Cost per linear foot.
102 tons riprap stone, at $2.25	
29 cubic yards concrete in blocks, at $7	

If constructed of concrete blocks of regular shape, laid clo bonded together, the mass being founded on a riprap base, as on the accompanying sheet, the estimated cost would be as follo

	Cost per linear foot.
57 tons riprap stone, at $2.25	
11.1 cubic yards concrete in blocks, at $10	
5.2 cubic yards concrete en masse, at $10	
2.3 cubic yards concrete in bags, at $10	

There are numerous instances of breakwaters built in the form of the latter that have successfully stood the attacks of waves in places of greater exposure than that at Lynnhaven Bay, hence it may be considered perfectly safe to adopt that form of construction.

The entire estimated cost of such a breakwater, of the total length of 4,500 feet, as shown on the accompanying map, including 10 per cent for contingencies, is $1,555,538.

I would recommend the latter method of construction.

Very respectfully, your obedient servant,

PETER C. HAINS,
Lieut. Colonel, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

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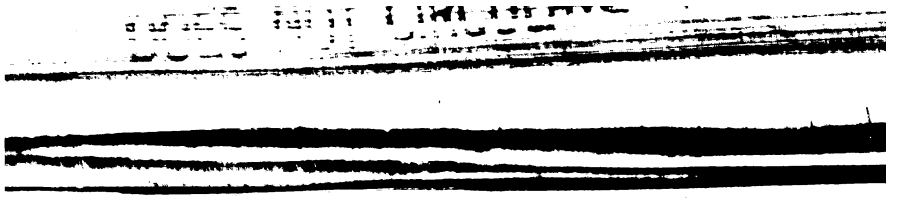

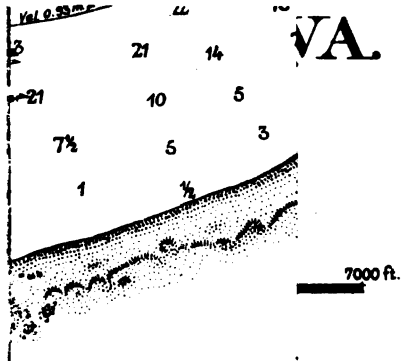

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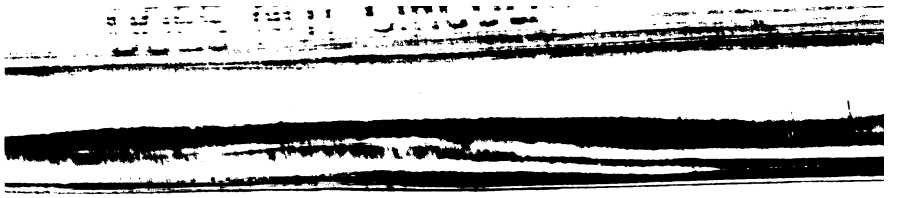

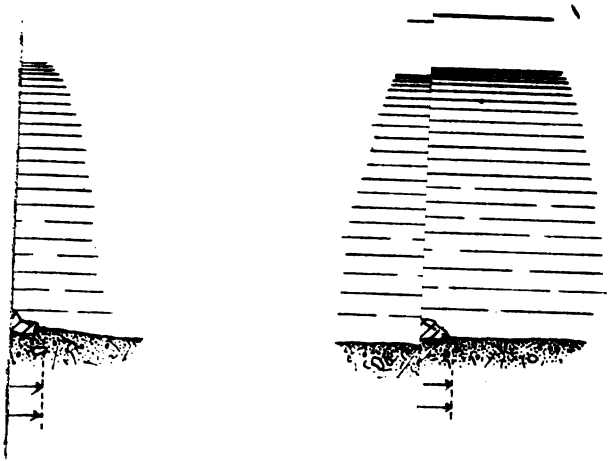

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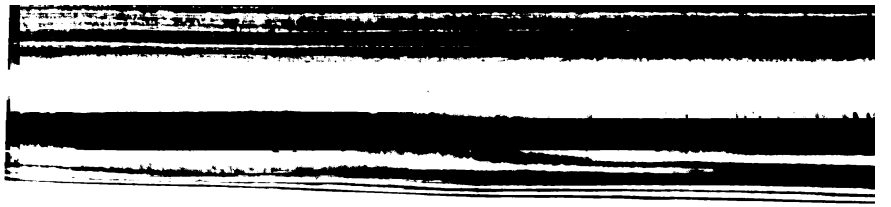


52D CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { EX. DOC. No. 28.

WILLAMETTE RIVER, OREGON.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING,

With a letter from the Chief of Engineers, report of the examination and survey of the Willamette River, Oregon.

JANUARY 5, 1892.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 8, 1891.

SIR: I have the honor to inclose herewith a letter from the Chief of Engineers, dated November 24, 1891, together with a copy of a report from Maj. Thomas H. Handbury, Corps of Engineers, dated October 30, 1891, of a preliminary examination and survey of Willamette River, Oregon, for improvement of navigation at Clackamas Rapids and Ross Island and near city of Corvallis, made by him in compliance with the provisions of the river and harbor act of September 19, 1890.

Very respectfully,

L. A. GRANT,
Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., November 24, 1891.

SIR: I have the honor to submit herewith copies of the following reports by Maj. Thomas H. Handbury, Corps of Engineers, made in compliance with provisions of river and harbor act approved September 19, 1890:

Report of September (November ?) 19, 1890, on preliminary examination of Willamette River, Oregon, at Clackamas Rapids and Ross Island and near city of Corvallis.

Report of September 30, 1891, with map, on project for improvement of Willamette River at Ross Island, Oregon.

Report of September 30, 1891, with map, on survey of Willa
River at Clackamas Rapids, Oregon.

Report of October 30, 1891, on survey of Willamette River
Corvallis, Oregon.

The proposed improvement at Ross Island contemplates closin
middle and east chutes at that locality by dams to a height of 4
above low water, and to assist the erosion thus caused in the west
or channel by such dredging as may be necessary to form a channe
feet wide and 14 feet deep at low water. It is also proposed to im
the bar about a mile above the head of Ross Island, in front o
town of Sellwood, by dredging a channel through it 100 feet wide
14 feet deep, and by constructing a contracting dike about 400 feet
from one or the other bank. The estimated cost of the work pro
at these localities is as follows:

Ross Island:	
Construction of dams	$
Dredging	
Sellwood Bar:	
Dredging	
Construction of dike	
Contingencies	
Total	

The proposed improvement at Clackamas Rapids contemplate
moval of the old dam at the head of the rapids; construction of a
to a height of at least 10 feet above low water, extending from a
just above the junction of the right bank of Willamette River wit
left bank of Clackamas River, 6,000 feet down the Willamette, so
turn the current of the Clackamas more nearly parallel with that o
Willamette and impound the detritus brought down by the Clack
on the shoals below its mouth and inclosed by the dike; and cons
tion of a dike 6 feet high and 800 feet long to contract the chann
Jennings Shoal, at the foot of the rapids. The total cost of this
is estimated at $78,000. Col. G. H. Mendell, Corps of Engineers,
sion Engineer, Pacific Division, states that a preferable plan woul
to store the débris in the Clackamas before it reaches the Willam
and that before the work is begun an examination should be mad
determine if this is practicable.

The proposed improvement at Corvallis contemplates clearing
chute in the first bend above Corvallis of obstructions, such as f
trees and driftwood, and cutting away trees and underbrush alon
banks, so as to provide a passage for the water during high stages.
thus improve the regimen of the river in this vicinity. The cost of
work is estimated at $5,000.

The total estimate of cost of the work proposed in the Willam
River at these localities is as follows:

Ross Island	$5
Clackamas Rapids	7
Corvallis	
Total	13

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Brigadier-General, Chief of Engineer

Hon. REDFIELD PROCTOR,
Secretary of War.

PRELIMINARY EXAMINATION OF WILLAMETTE RIVER, OREGON, FOR IMPROVEMENT OF NAVIGATION AT CLACKAMAS RAPIDS AND ROSS ISLAND, AND NEAR CITY OF CORVALLIS.

UNITED STATES ENGINEER OFFICE,
Portland, Oregon, September 19, 1890.

GENERAL: To comply with your letter of September 20, 1890, directing me to make preliminary examinations and reports upon certain rivers and bays, provided for in the river and harbor act approved September 19, 1890, with a view to ascertaining whether or not they are worthy of improvement by the General Government, I have the honor to report as follows upon—

Willamette River * * * improvement of navigation at Clackamas Rapids and Ross Island and near city of Corvallis.

The falls of the Willamette are located on that river about 12 miles above the city of Portland, Oregon. Around this immense water power there is gradually being built up large manufacturing establishments and commercial interests. There are also large interests invested along the river between the two places, notably the iron manufacturing establishment at Oswego. There is communication by water between Portland and Oregon City at Willamette Falls. At low water boats drawing more than 3 feet can not ascend to Oregon City, and those drawing more than 6 can not ascend to Oswego. In this portion of the river the two formidable obstructions to greater draft boats are the bars at Ross Island and Clackamas Rapids. The Ross Island bar is near the upper or southern limit of the city of Portland. It is caused by a widening of the river bed in this locality, which disperses the waters, diminishes the flood velocities, and causes a deposition of the heavy material carried along. It will be practicable to improve this bar within reasonable limits of expense to such an extent that vessels drawing 10 feet or more can pass over it at low water. This would be of great assistance to the large interests that are being developed along this reach of the river.

The river and harbor act approved September 19, 1890, appropriates $11,000 for improving Willamette River above Portland, "of which sum $5,000, or so much thereof as may be necessary, may be used, in the discretion of the Secretary of War, for improvement of the river at Clackamas Rapids and Ross Island." In my project for the expenditure of the amount thus appropriated, which was submitted under date of October 6, 1890, and has been returned to me approved, provision was made for a survey of the Willamette River in the vicinity of Ross Island. The field work of this survey has been done, and as soon as the notes can be worked up, plans and estimate of cost of the improvement necessary to be made will be submitted. No allotment from the item appropriated for examinations and surveys will be required for this locality.

Clackamas Rapids is located about 1½ miles below Willamette Falls. At this point the Clackamas River, having a slope of 12 feet to the mile, joins the Willamette with a slope of less than 1 foot per mile. Large quantities of coarse gravel and heavy material are brought down during freshets in the Clackamas and deposited in the Willamette, causing shoal water and a rapid that is very much of an obstruction to navigation. The low-water depth over these rapids does not at present exceed 3 feet. It is practicable to make a considerable increase in this depth which would be very much to the benefit of the commerce of this portion of the river and would be a material aid to the manufacturing interests centered about the Willamette Falls.

Some additional surveys and investigations will be necessary a point in order that plans and estimate of cost of the improv necessary may be made. For this purpose I recommend that an ment of $400 be made from the funds available for examination surveys. The present commerce of the river is about 50,000 tons capital is invested at the falls and at other localities along the below, this commerce will of course increase, and this increase w greater or less, according as the river is in a more or less navi condition.

The city of Corvallis is located on the concave bank of a sharp in the Willamette River. For some years past the river has been ing its banks in the bend next above this and has been threaten cut-off, which if permitted to take place would leave Corvallis som 3 miles from the river. A portion of this eroded bend has been tected by the General Government at a cost of $12,500. During high water of the Willamette of last February the Corvallis Boa Trade was greatly alarmed lest this cut-off would then take pla a large column of water was escaping through the fields and acro neck of land opposite the city. Some efforts were then made to o Congressional action in the matter, but nothing could be done. revetment so far as it extended protected the bank, but erosion tinued above it. It is necessary in the interests of the commerce Willamette River that this locality receive further special attenti the hands of the Government. Before deciding what is best to be a careful survey covering about 5 miles of the river should be ma ascertain what is the extent of the change that has taken place within recent years and what are the real probabilities of a cu Other data necessary to the formation of plans and estimates fo work required should be collected. For this work there shoul allotted $1,000.

The Willamette River at Clackamas Rapids and Ross Island near the city of Corvallis I believe, for reasons stated herein, t worthy of improvement by the General Government, and so re after having made personal examination at these localities.

Very respectfully, your obedient servant,

THOS. H. HANDBURY,
Major, Corps of Engine

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. G. H. Mendell, Corps of Engineers, Division Engi Pacific Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
San Francisco, Cal., November 21, 18

Respectfully forwarded.

The Willamette River at the three points named—Clackamas Ra Ross Island, and Corvallis—is considered to be worthy of improvei

G. H. MENDELL,
Colonel, Corps of Engineers,
Division Engine

PROJECT FOR IMPROVEMENT OF WILLAMETTE RIVER AT ROSS ISLAND, OREGON.

UNITED STATES ENGINEER OFFICE,
Portland, Oregon, September 30, 1891.

GENERAL: In compliance with your instructions based upon the requirements of the river and harbor act approved September 19, 1890, I have the honor to submit the following project for the improvement of the Willamette River at Ross Island. This island is located near the southern limit of the city of Portland, where the river suddenly widens from 1,400 feet to 5,200 feet, and then becomes contracted again to 1,600 feet within a distance of about 2 miles. There are here two islands, which divide the river bed into three channel ways, each about 800 feet wide. Across the head of these there is a low flat gravel bar. At extreme low stages all the water discharged by the river passes down the west channel way. At stages above this the other two carry off their proportion of the water, and at extreme high stages the islands are flooded. As a result of these topographical conditions the depth of water available for navigation is not as great in this portion of the river as in the reaches below, and immediately above where 18 feet at low water may be considered as the ruling navigable depth. In the west channel, where all the water is to be found during the low stages, there is a shoal bar which limits the draft of vessels to 7 feet.

In this locality the high water of February, 1890, which is perhaps the highest of authentic record, reached a height of 30 feet above extreme low water. The volume of discharge at low-water stage is approximately 15,000 cubic feet per second. The extreme rise and fall of tide at low water is about 3 feet.

The material composing the river bed in this locality is sand and heavy gravel closely compacted, and offering great resistance to the eroding efforts of the water. In some places cobblestones of considerable size may be found packed in with this material.

It was noticeable that at certain points in this locality a considerable change had recently taken place. Our most recent map covering this reach of the river was constructed from surveys made in the fall of 1886. Before a project for improving the river for navigation could be intelligently studied, a new map from more recent surveys was necessary. These surveys have been made. A tracing from the map constructed accompanies this report. By comparing this with the previous one, a copy of which was forwarded to the Chief of Engineers with a report under date of December 31, 1888, the changes that have taken place will be noted. The sand and gravel have filled in materially around the heads of the middle and east channel ways, and these have been practically closed to low water. As a consequence of this more water has been passing through the west channel, which is now in a better condition than formerly. Although the material here is hard and compact, there is evidence that a considerable erosion has taken place. By increasing this erosion we may expect eventually to form a very satisfactory channel over this shoal. The ruling depth at low water is now 9 feet.

The deep-draft vessels that now have occasion to go above this shoal draw from 12 to 16 feet. The Willamette River at this point is subject to two annual floods; one, occasioned by backwater from the rise in the Columbia River, may extend from the latter part of May to the end of August. The extreme of this rise has reached 28 feet. The other comes from the rainfall on the watershed of the Willamette, and com-

ids is one-half mile above this point and 2¾ miles below the falls of the Willamette at Oregon City.

The most important manufacturing interests that will be benefited by this improvement are located at Oswego, 8 miles above Portland. The yearly tonnage of the material used and the output of the Oregon Iron and Steel Company, located at this place, amounts to 75,000 tons. Whenever the river is in a condition to permit deep-sea vessels to get over the bars that it is in contemplation to improve, a large proportion of the raw material and manufactured products of this concern are transported in such vessels directly to and from the works. When it is not in this condition the expensive process of lightering must be resorted to. If this industry could be fostered to the extent that would result from this improvement there is every reason to believe that it would be greatly increased, to the advantage and development of the country.

The quarries from which rock is at present obtained for the jetty at the mouth of the Columbia River are located near Oswego. It is expected that during the present year between 150,000 and 200,000 tons will be used. This is transported in barges drawing 9 feet when fully loaded. Any improvement of the low-water depths over these shoals will be of great benefit to this work. The commerce that would be benefited by this improvement would seem to warrant that it be made.

Very repectfully, your obedient servant,

THOS. H. HANDBURY,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. G. H. Mendell, Corps of Engineers, Division Engineer, Pacific Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
San Francisco, Cal., October 6, 1891.

Respectfully forwarded to the Chief of Engineers, U. S. A., recommended.

G. H. MENDELL,
Colonel, Corps of Engineers, Division Engineer.

SURVEY OF WILLAMETTE RIVER AT CLACKAMAS RAPIDS, OREGON.

UNITED STATES ENGINEER OFFICE,
Portland, Oregon, September 30, 1891.

GENERAL: I have the honor to submit the following project and estimate for the improvement of the Willamette River at Clackamas Rapids, Oregon, required by the provisions of the river and harbor act approved September 19, 1890.

The difficulty in navigating the Willamette River at this point during the lower stages of water is occasioned by the presence of a bar composed of coarse sand and gravel firmly compacted together. These materials are brought down by the Clackamas River, which here empties into the Willamette. During the season of high water in the Willamette the velocity is checked at this point, both by reason of a sudden

increase in the discharge section and the meeting of the current from the Clackamas. This, of course, causes a deposition of the material being carried along by both streams. The Willamette at its lower stages has not sufficient volume or velocity to carry this material farther down. The result is a submerged gravel dam over which boats navigating the river must climb in their passage up the river. The presence of this dam has increased the low-water slope of the river from 3 inches per mile, the average from Portland to the foot of the rapids, to 3 feet and 5 inches per mile, over a distance of about 9,000 feet. The average low-water slope from Portland to Oregon City is 7½ inches per mile. The Clackamas River, coming in nearly at right angles to the Willamette, has a slope of 12½ feet per mile. We have no data concerning the volume of its discharge. At low water it is insignificant, but during the rainy season its volume is considerable, bringing down large quantities of heavy gravel, as the results show. The low-water discharge of the Willamette is about 15,000 cubic feet per second.

In the fall of the year 1851 an attempt was made to improve navigation at this rapid by building a dam from the left bank at the head of the rapid out into the stream so as to force the Willamette water over to the right bank where the Clackamas enters, with the design to establish the channel down that side. This resulted in an entire failure, and low-water navigation terminated at this point until a part of the dam was removed. The dam was made of brush and gravel, and paid for from funds raised by subscription among the citizens of Oregon City. There was already too much dam in the Willamette caused by the débris brought down by the Clackamas. From time to time portions of this old dam, which is now entirely submerged at low water, have been removed. The opening through it is now about 200 feet in width with a depth of 3½ feet at low water. Boats of ordinary power ascend this rapid at all stages of the river. At the extreme low stage considerable trouble is experienced and sometimes the process of lining has to be resorted to.

In consequence of this débris brought in by the Clackamas a pool is found in the Willamette River which extends almost a mile up to the foot of the Willamette Falls. These falls are surmounted by a series of four locks, having a lift of 10 feet each. These locks and the water power of the falls are owned and operated by a corporation existing under the laws of the State of Oregon. The lower miter sill of these locks is located with reference to the low water in the pool so as to give a depth of 3 feet over it at that stage. Were the whole of this gravel bar removed, or even so much of it as would accommodate the low-water discharge of the river on the same slope that it has from Portland to the foot of the rapids, there would result a lowering of the level of this pool at low-water stages which might interfere with the passage of boats into the lower lock. This, however, will not be necessary in order to improve the navigation for all present wants of commerce.

The present low-water channel of the Willamette River through the steepest part of this bar has an average width of about 300 feet with a slope of about 1 on 1,000. Its mean depth is 8 feet, excepting in the section just at the summit of the rapid where the old dam is located. The width here is 500 feet. This channel seems to be all that the low-water flow of the Willamette can maintain against the encroachments of the high-water débris from the Clackamas.

The problem of improvement resolves itself into two distinct parts, one to provide a good low-water channel for the Willamette without affecting the depth of water on the miter sill of the lower lock at Oregon

City; the other to make such disposition of the Clackamas débris as will prevent it from causing further trouble to navigation through this channel.

If the head of the present channel be improved by removing the remaining portion of the old dam and dredging away sufficient of the gravel in this locality to insure a depth of 8 feet it will be simply extending the present low-water slope farther up stream, but will not affect the condition in the vicinity of the lock. In fact this slope might be diminished one-half without molesting these conditions.

In this locality the ordinary high-water lines of the two banks of the Willamette are about 1,400 feet apart. The left bank is rocky, the right a compact gravel overlaid with soil.

The intervening space is occupied with bars composed of coarse gravel and sand, through which the Clackamas makes its way to the Willamette. These bars are from 2 to 8 feet above the low-water stage, and are now partially covered with a vigorous growth of young willows. During the higher stages of the Clackamas it empties most of its water and débris into the Willamette at the head of the rapids, the two currents being nearly at right angles to each other. If at this time the Clackamas could be turned and made to enter the Willamette farther down in a direction more nearly that of its current, much of its heavier material would be deposited upon these bars, and the balance could be taken care of by the combined waters of the two rivers acting together in the same direction.

To accomplish this turning of the waters of the Clackamas I recommend that a dike be built from the right bank of the Willamette River near its junction with the left bank of the Clackamas, extending across the direction of this latter river and down as far as may be necessary to control the waters over the gravel bar; the lower portion of this dike to be about 400 feet from the low-water line of the left bank of the Willamette. The height of the dike should be at least 10 feet above low water or above that of the highest part of the adjacent gravel bar. It should be built of brush, piles, gravel, and rock. Where the brush will be below low water, as for instance opposite the old dam, it could be used liberally and loaded with rock to prevent erosion. The other portions of the dike would be made of heavy gravel, revetted with rock of sizes that could not be washed away. There is an abundance of material in the immediate vicinity.

In section the dike should be 6 feet across the top with an outer slope of 1 on 2, and an inner slope of 1 on 1. The area of this section will average about 20 square yards. The length of the dike that it is necessary to construct is 6,000 feet.

This brings us to a point where the high water of the two rivers is confined between rocky banks less than 1,000 feet apart. A depth of 42 feet is found here. Immediately below this point, however, the river bed again widens and we find only 5 feet in the channel. This locality is called Jennings Shoal and gives considerable trouble to boats during low water. A large portion of the high water here escapes this shoal by going behind Walings Island. If this water were controlled for a distance of about 800 feet farther it would improve this shoal to the extent of giving at least 8 feet in the channel. For this purpose it is recommended that a stone dike 6 feet high be built from the rocky projection on the left bank, extending down stream 800 feet. The material for this can be obtained in the immediate vicinity.

The aggre gate length of these dikes is 6,800 feet, the cost of building should not exceed $1.50 per cubic yard, or $10 per linear foot.

The removal of the old dam at the head of the rapids can be effec by charges of dynamite; at the same time the gravel in which it is bedded is loosened and washed away. The cost of this work it is d cult to accurately estimate. It may be approximately given at $3,0 The total estimate of the cost of the improvement in accordance w the project is as follows:

Removal of the old dam	$3,
Construction of 6,800 feet dike, at $10	68,
	71,
Contingencies	7,
Total	78,

The traffic to be benefited by this improvement as shown by the formation furnished for the year ending June 30, 1891, by the tra portation companies doing business on this portion of the Willame River, was 116,600 tons.

Very respectfully, your obedient servant,

THOS. H. HANDBURY,
Major, Corps of Engineers

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. G. H. Mendell, Corps of Engineers, Division Engine Pacific Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
San Francisco, Cal., November 2, 1891

Respectfully forwarded.

The object of the construction is to store in the Willamette River b gravel brought down by the Clackamas, which is a large stream freshet, with a steep slope. After a period longer or shorter, perha a few years, storage room will be exhausted. A preferable plan, practicable, is to store the gravel before it reaches the Willamette. does not appear that an examination showing whether or not this s tem is practicable has been made. It ought to be made before t project is carried out. An examination may require modification of t project. Subject to this consideration the project is recommended.

G. H. MENDELL,
Colonel, Corps of Engineers,
Division Engineer

SURVEY OF WILLAMETTE RIVER NEAR CORVALLIS, OREGON.

UNITED STATES ENGINEER OFFICE,
Portland, Oregon, October 30, 1891

GENERAL: The river and harbor act approved September 19, 18 provides that an examination and survey be made with the view to i proving the navigation of the Willamette River, near the city of C vallis, Oregon, and also that an estimate of the cost of the necess improvement be submitted. This duty having been assigned to me your letter of October 21, 1890, I now have the honor to submit the lowing report* thereon:

* Map accompanying this report not printed.

The reach of river deemed necessary to be surveyed in order to arrive at a proper conclusion as to what should be done in this case extends from a point 2 miles below Corvallis to a point 5½ miles above, measured in a straight line. By the meanderings of the present steamboat channel the distance between these extreme points is 13 miles. The average low-water slope throughout this reach is 2.44 feet per mile. The slope at high water is 2.36 feet per mile. Throughout a portion of the distance above Corvallis the low-water discharge is divided between three channels, and during extreme high water the whole valley, with the exception of a few isolated patches, is overflowed. The least distance between banks not overflowed within the limits of the survey is 2½ miles. The high bank opposite Corvallis is 6 miles distant. The bottom is cut up with sloughs, high-water channels, and old river beds, that serve as outlets for the water at medium and ordinary high-water stages. A portion of the bottom is covered with a thick growth of timber and underbrush, and another large portion on a little higher level has been cleared and is under cultivation. The soil here is rich and brings forth abundant crops when they can escape overflow. These lands are subject to overflow at stages ranging from 12 to 20 feet above the low-water stage of the river. The extreme high water of February, 1890, reached 29 feet.

Before these bottom lands were cleared and placed under cultivation the heavy timber and underbrush with which they were covered retarded the water during the periods of their overflow and prevented the washing away of the soil. At the medium and low stages of the river, when it was confined between its banks, the erosion of these banks was limited, on account of the hard nature of the substratum on which the soil rests. This in general is compact gravel or a mixture of clay and sand, offering considerable resistance to the erosive action of the water. At places the soil or sand more loosely formed will extend below low water. When the land is cleared off and the soil loosened up by cultivation the high-water currents have a more marked effect upon the top layer of soil. The damage is greater and more noticeable as the country becomes more settled and more of the ground is brought under cultivation. This land is not overflowed every year; sometimes a period of six or eight years may elapse without a serious flood. Its exceeding great productiveness induces the farmer to take these chances.

In the reach of 3½ miles from Corvallis upstream the river makes a well-defined S. In the upper curve of this S it has been slowly eroding its bank, making the curve deeper. Plotting the original meander notes made in 1852, obtained from the surveyor-general's office, on our recent map, it appears that the apex of the concave bank has advanced 775 feet, or at the average rate of 20 feet per year. The land that has been washed away amounts to 54 acres. The value of this at present prices should not exceed $2,000.

In this locality we find several low places in the land, through which high water escapes across the neck into the river below. Some alarm has been felt lest the whole body of the river might break through here and leave Corvallis some 4,000 feet from the navigable channel of the river. The river and harbor act of 1888 authorized the expenditure of $14,000 in revetting this bend to prevent the threatened change of channel. The bank was graded down to a slope of 1 on 2 and revetted with brush and rock over a width of 18 feet for a distance of 1,676 feet. This effectually protected this portion from further erosion and is still in good condition. In addition to this there was a row of piles 6 feet apart driven on the top of the bank a short distance back from the edge

with the view to catching drift and checking the velocity of the wate when it reached the overflow stage, the idea of this being to assim late the conditions existing before the trees and underbrush were cu away. The effect of the high water of February, 1890, upon this, an the resulting scouring action of the water in its immediate vicinity were not such as to warrant the further construction of works of this character. Above the upper end of the revetted portion of the bank there is a hard gravel beach for a distance of about 1,400 feet. This extends back from low water from 50 to 100 feet; then comes the bluff soil bank from 8 to 10 feet high, eroded more or less at high water. In this locality is the head of a low place in the land through which the water flows at ordinary high stages. Above this for a considerable dis tance the same gravel bed seems to underlie the bluff bank and protect it from erosion except at the higher stages of water. The profile along this low swale shows that the water commences running through it at a 10-foot stage. At that stage the water is 2½ feet above the top of the bank across the lower end of the slough and is backed up to within about 1,700 feet of the point of overflow at the upper end. The fall is then 10 feet. At the low-water stage the surface of the water in the river is on a level with a point 3,500 feet below the head of the swale. This seems to be filled about the head with coarse heavy material brought in during high water. The evidence that this is enlarging or growing deeper is not conclusive.

The total amount expended by the United States in protecting this bend was $12,496.

From a study of the results of this survey and a personal visit to the ground during high water and again at low water, I can not conclude that there is any danger that the channel of the river at low water will pass over this neck within any reasonable time in the future, or that the city of Corvallis will be deprived of its advantage of water transporta tion. At high stages of the river the water will continue to pass over these bottom lands as it has done in the past, and no amount of money within reason will prevent it.

The present condition of the river in this vicinity as regards naviga tion may be classed as very good when compared with many other localities along its course where no improvement is contemplated.

In the first bend above Corvallis we find the lower end of a chute that leads across a narrow neck to the river above. The length of this is 3,000 feet. At a 5-foot stage the water commences to run through this chute. The difference of level in the river at this stage between the head and foot of the chute is 8 feet. It is at present very much ob structed with fallen trees and driftwood. If this were cleared out and the trees and underbrush along its banks cut down for some distance back, it would gradually enlarge and serve as an escape during ordinary high stages for a large portion of the water that now passes down around the bend and over the bottom land in front of Corvallis. This fall of 8 feet in a distance of 3,000 feet will give a very swift current through the chute when it is cleared of the obstructions that now encumber it. The sand and gravel at its head may be expected to be washed away and in time the low-water flow of the river may take this course. This will produce a radical change in the regimen of the river in this vicinity and give great relief to the bend below. Navigation during the low-water stages will probably not be so convenient when this takes place as at present, but in time as the head of the slope is washed down it will be less steep and the velocity of the water diminished.

To the extent of clearing out this chute as indicated above I recommend that work be done in this locality, and estimate the cost of the improvement at $5,000.

Very respectfully, your obedient servant,

THOS. H. HANDBURY,
Major, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

(Through Col. G. H. Mendell, Corps of Engineers, Division Engineer, Pacific Division.)

[First indorsement.]

U. S. ENGINEER OFFICE,
San Francisco, Cal., November 17, 1891.

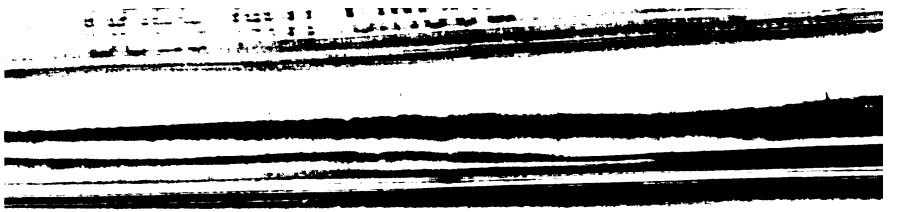
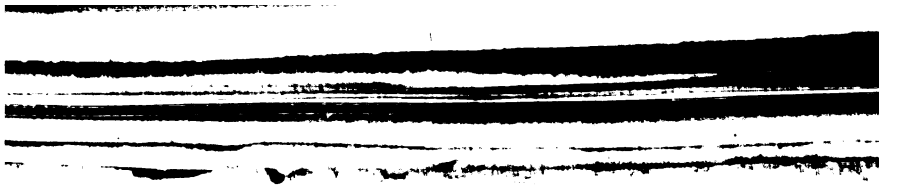
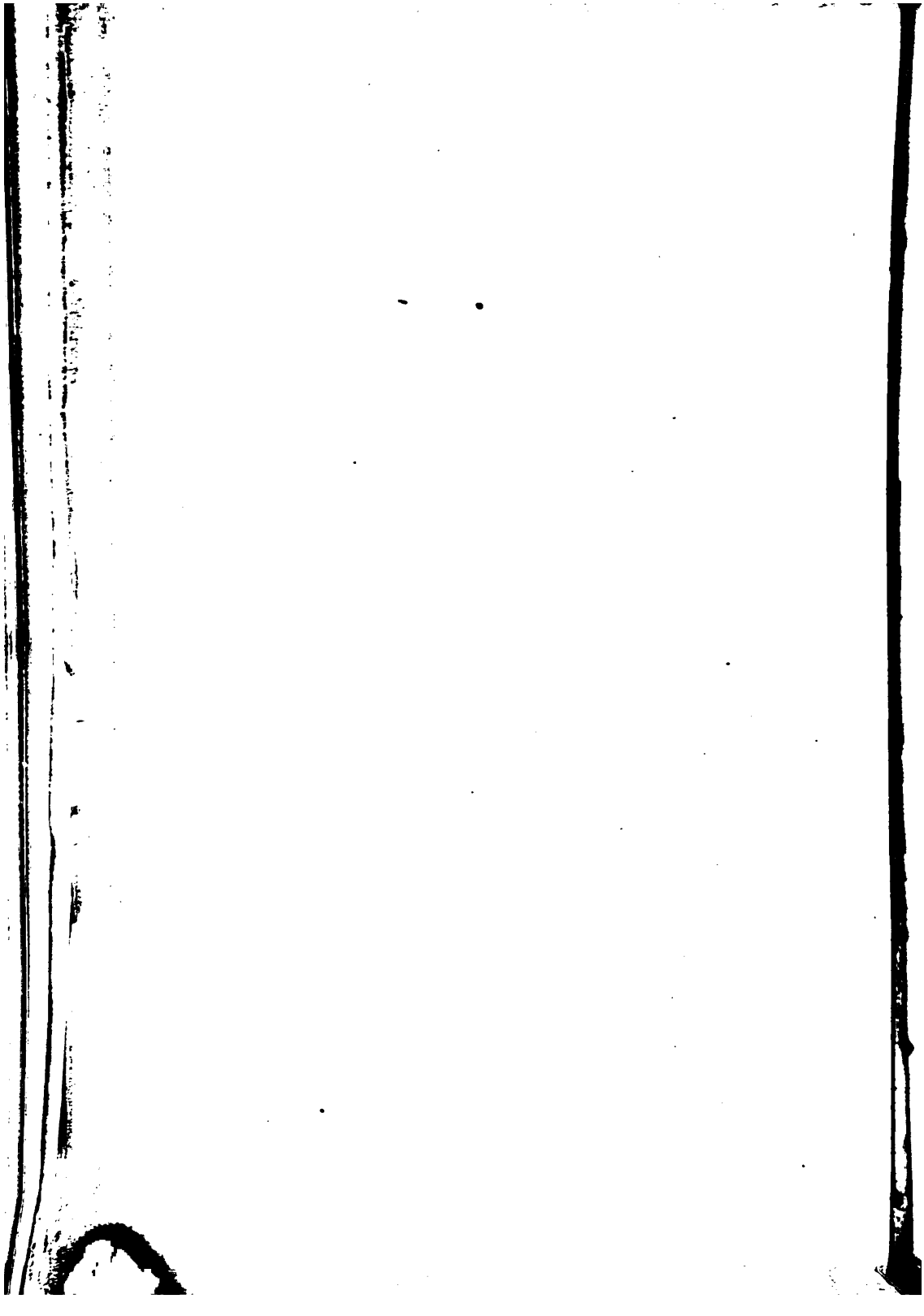
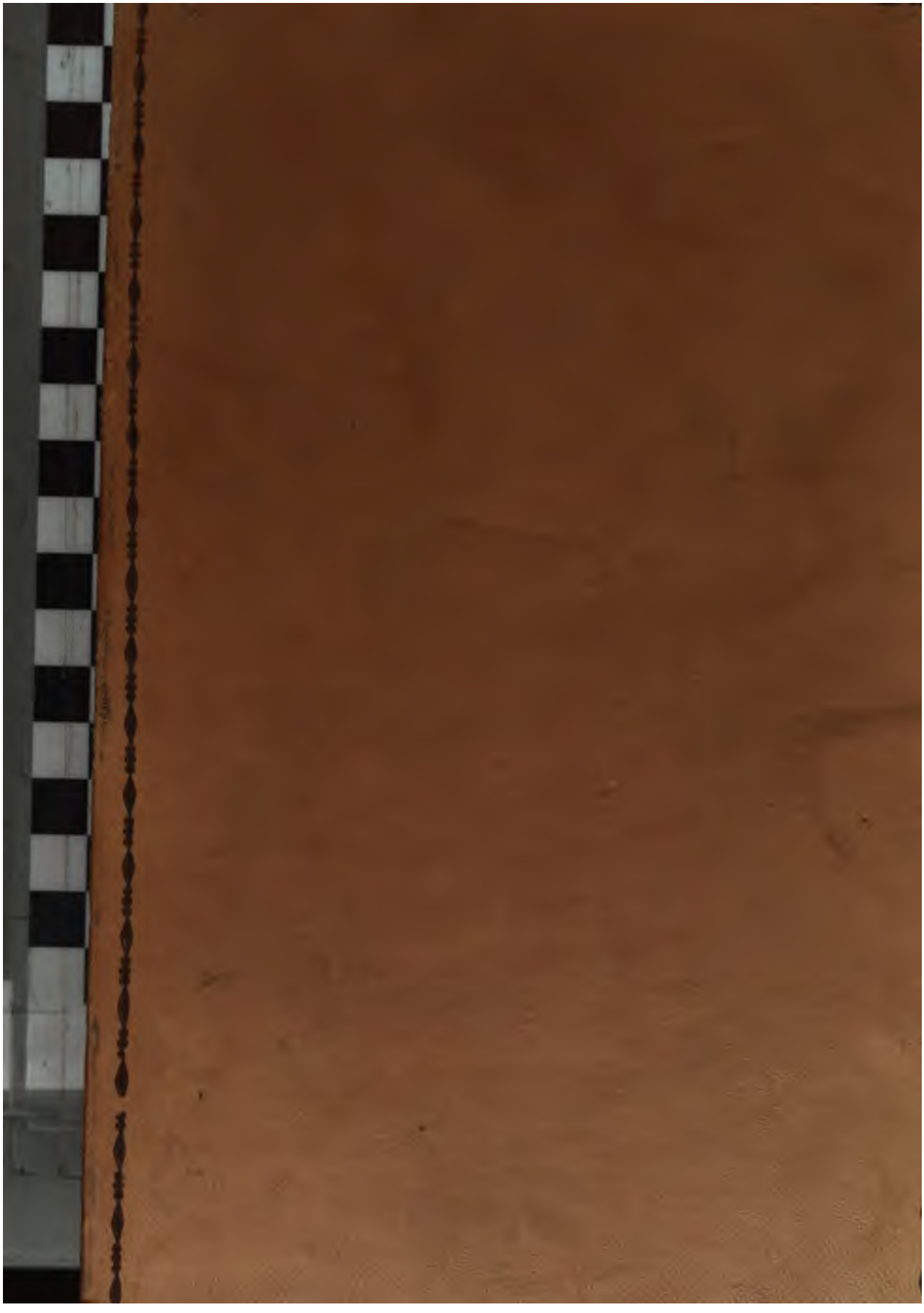
Respectfully forwarded.

If clearance of the chute A B shall result in a cut-off, the fall through its length of 3,000 feet will be 8 feet, being at the rate of 14 feet per mile, whereas the average fall per mile is about 2½ feet. We must, then, expect development of increased length by erosion of banks working great disturbance of the channel. Indeed, if the new river should not lower its slope by development of length it would become unnavigable at the cut-off.

It is not clear that the advantages to be secured can compensate for the disturbance to result, if the cut-off is to be a result.

It is stated by Major Handbury, in a letter of date subsequent to date of report, that indications point to a shifting of the low-water channel from the middle to the east branch. If this shall occur or if it become certain that clearance of the chute will not make a cut-off, the objections herein named will disappear.

Subject to these qualifications the project is recommended.

G. H. MENDELL,
Colonel, Corps of Engineers,
Division Engineer.

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